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ASPECTS OF HEALTH, NUTRITION AND NUTRITIONAL STATUS IN A CENTRAL RICE VILLAGE

STUDIES IN BANG CHAN, 1952-1954

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with the assistance of

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Cornell Thailand Project

Interim Report Series

Number Two

Data Paper: Number 22
Southeast Asia Program
Department of Far Eastern Studies
Cornell University, Ithaca, New York
1956

Price One Dollar

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[Title page]

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FOREWORD

114 The Cornell Thailand Project, like other Cornell University studies in community development, is a long term investigation in the field of the processes involved in changing cultural behavior in a non-industrialized society. Field research was begun in 1948 in the central plain of Thailand with base line studies of the rice farming community of Bang Chan and its environs. A collaborating staff of Thai and Americans representing different disciplines has continued to work in Thailand at Bang Chan and elsewhere in a series of phases extending to the present.

[113] The first interim report issued by the Project gives a general account of the economic, political and social organization of Bang Chan in 1948-49 together with some material on [128] health and diet (Sharp et al., 1953). Since the circulation of this first interim report was limited, some of the salient characteristics of Bang Chan should be outlined here.

361 Bang Chan is located some twenty roadmiles northeast of Bangkok, the rapidly growing major metropolis and capital of Thailand. The village is between two and three miles west of a small district administrative center and market town, [187] Minburi. A century-old canal and to the north of it a post- [991] war hard surface road connect Minburi and Bangkok so that villagers have easy access to these two centers by boat or bus.

621 In 1954, when data for the present study were still being 162 gathered, the population of Bang Chan was about 1700, divided among about 300 households. Roughly 60 per cent of the house- [592] holds were made up of independent nuclear families consisting of parents and unmarried children. The average size for all 243 families was 5.7 persons. Rice farming was the main occupa- 241 tion of 80 per cent of all families. The population in 1954 [463] worked and lived on about 2800 acres (7000 rai) of land. With [311] the exception of some 120 acres (300 rai) used for the home sites and home gardens scattered along the network of canals in the village, all land was devoted to the cultivation of wet rice. Nutritional density is thus practically the same as population density. Of the rice crop, 60 per cent or more may be sold, the remainder providing seed, feed, and the staple [132] food of the people. During the wet season and into the cooler 281 dry season, from May or June to February, the growing of the [517] single crop of rice is the main activity. The hot dry season from March until the rice planting begins again is a period of fiestas, ceremonies, and visiting.

621 The Thai countryside is divided into hamlets, each with [422] a headman in charge of the thirty to sixty households of the [128] hamlet. Seven such hamlets constitute the Bang Chan community. (In the Project studies they are identified by the initials BC and KY followed by a number).

and KY followed by a number.) The center of social life in Bang Chan is the Buddhist monastery or wat and the adjacent government primary school. The community simply consists of the clientele which regularly patronizes Wat Bang Chan and this school rather than other comparable institutions elsewhere in the region. Within the area of the community lives a minority of Thai Moslems constituting about ten per cent of the population. They have their own mosque which happens to be just outside Bang Chan, but they attend many secular and some Buddhist functions at Wat Bang Chan. A number of small stores, which also serve as coffee houses and men's clubs, are used as neighborhood centers in different parts of the village. Near the central wat and school, there is also a store, and the house provided by one of the headmen for use as the Project headquarters.

This present interim report of the Cornell Thailand Project includes some of the data necessary for the design of a program to improve health and diet in Bang Chan. Another report, now in preparation, will give the results of a detailed dietary survey made in the community following the health survey reported on here. These two studies together will indicate existing deficiencies in health and diet, and will permit the formulation of recommendations for needed changes in behavior as these can be realized in the context of the village and national culture.

The author of this study, Dr. Hazel M. Hauck, is Professor of Food and Nutrition in Cornell University. She has been associated with the work of the Cornell Thailand Project since 1950. She not only designed and supervised the research on health, nutritional status, and diet in Bang Chan, but during almost a year of field work in Thailand she obtained valuable data on many other topics for the Project's files. Some of her daily work in Bang Chan made little sense to the villagers, but they nevertheless became devoted to her. Her energy, tact and fine spirit in facing the discomforts and difficulties of rough field work in a tropical foreign land inspired both her Thai and American associates. Working with Professor Hauck were Dr. Amusith Rajatasilpin, now a teacher in the School of Public Health in Bangkok; Miss Sapha Indrasud, now in the Ministry of Public Health; Dr. Chumlong Kittiveja, of the Dental School of the University of Medical Sciences, Bangkok; and Miss Saovanee Sudsaneh, who has been doing post-graduate work in nutrition at Cornell and Harvard. To all of these faithful workers, the Cornell Thailand Project is greatly indebted.

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September, 1956

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ACKNOWLEDGMENTS

114 For the period of her field study, 1952-53, the author received an award for advanced research from the United States Educational (Fulbright) Foundation in Thailand.

The author wishes to express her gratitude for the assistance of her Thai co-workers: Dr. Amusith Rajatasilpin and Miss Sapha Indrasud, whose services were provided by the Food and Drug Administration, Bangkok, Thailand, through the courtesy of its director, Dr. Yong H. Chutima; Dr. Chumlong Kittiveja, whose services were made available through the courtesy of Dr. Luang Vach Vidyaddhana, Dean of the Dental School, University of Medical Sciences, Bangkok; and Miss Saovanee Sudsaneh, who served as field worker with the Cornell Thailand Project during 1953-54.

[126] Stool examinations were made at the Department of Pathology, Chulalongkorn Hospital, Bangkok.

[128] Some preliminary tabulations and analyses of data were made at the Division of Statistical Services, National Economic Council, Bangkok, through the courtesy of its director, Dr. Tooi Xocusai.

ooo For the interest and friendliness of the people of Bang Chan, without whose cooperation the study would not have been possible, the author is particularly grateful.

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Summary

12 The general condition of health and sanitation in the village of Bang Chan, Thailand, and the nutritional status of 166 persons in a random sample including 31 village households and of 233 primary school children are described.

141 The mean height for adult men in the random sample was 158.6 cm. (62.4 inches) and for women, was 151.3 cm. (59.6 inches).

Mean weights for adult men and women were 53 kg. (116.6 lb.) and 45.3 kg. (99.7 lb.) respectively. Mean and median weights for various age groups did not differ markedly nor consistently.

145 In general, the Thai children were shorter and weighed less than western children of the same ages. Mean heights and median weights fell below the 10th percentile of Iowa school children whose measurements have been reported by Stuart and Meredith (1946).

The reported age at menarche, for 94 females in Bang Chan, ranged from 13 to 19 years, with a median age of 15.

As judged by the median ages of eruption of specific permanent teeth and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan was approximately the same as that of children in other regions, both western and eastern, for which data are available. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent.

164 Children in the Bang Chan primary school were found to be relatively free from caries. Of 226 school children 7 to 14 years of age, whose teeth were examined by a dentist, 42% were completely free of caries of both deciduous and permanent teeth. Of the total group of children, 68% (76% of 116 boys and 60% of 110 girls) were free of caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the children examined had any filled teeth.

The reason for the relatively low incidence of caries

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among children in Bang Chan is not known. One thing which residents of Bang Chan appeared to have in common with other populations which have been reported to be relatively caries free, was low intake of sugar, particularly in a form which would be apt to adhere to the teeth.

Adults up to 44 years of age, in the random sample, retained most of their teeth. A few adults in Bang Chan have had missing teeth crowned. More sound than missing teeth were found to be crowned, however, i.e. in this community a crowned tooth appears to have cosmetic value.

A variety of serious illnesses were found to occur among residents of Bang Chan. As a rule, local traditional practitioners were consulted first, but most persons reported to have been seriously ill eventually received treatment by outside practitioners with some training in modern medicine.

The majority of mothers in childbirth were attended by local traditional midwives, but a few difficult cases were taken to the government Health Center in the nearby town of Minburi, where a trained midwife was in attendance.

Of 438 pregnancies reported by 84 mothers, over 90% resulted in live births. Of the 397 living children born to these women, 81% survived at the time of interview. Within the first month of life, 7% had died, and a total of 11% died within the first year. Tetanus was prominent among causes of death of infants under one month of age. Infantile beriberi caused some deaths among older infants. In a majority of cases, the cause of death of infants could not be clearly identified, but fever, debility and convulsions were the symptoms most commonly described.

Almost half of the persons examined for possible signs of nutritional deficiency, 46% of the school children and 47% of the family sample, were free of such signs. The remainder, slightly more than one half of persons examined, had from 1 to 7 signs each. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Signs most often noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine in the diet. The only clearly defined deficiency disease observed among residents of Bang Chan during the field study was beriberi.

Hemoglobin values of 11.5 g or less per 100 ml. were

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14 observed in 9% of the school children 7 to 14 years of age who were examined, and in about 6% of the males and 25% of the females over 15 years of age. Of 337 persons examined, however, 2 only, one child and one adult female, were found to have hemoglobin values under 9.75 g per 100 ml.

744 Modern sanitation was practically unknown in Bang Chan. Few families had covered pit latrines or made any effort to [514] cover excreta. Intestinal parasitism was common. Garbage [164] might be fed to animals, but was frequently thrown into the [364] canal or elsewhere about the compound. Provisions for protecting foods from contamination were meager.

When rain water was available, it was used for drinking, but several months each year water from the canals or fish ponds was used without prior treatment. For washing vegetables, cooking and washing dishes, canal and pond water was used throughout the year.

744 A few changes in sanitary practices, if they could be
751 brought about, might reduce some kinds of illness substantially. For example, if the villagers would adopt the practice of boiling pond or canal water whenever it is to be used for drinking, contamination from this source would be materially reduced.

Use of boiled water for bathing babies and all persons with abrasions or open wounds would probably reduce the incidence of skin infections, and enable those which do occur to heal more quickly.

Infantile tetanus could be largely if not entirely prevented if the local midwives were taught to use sterile scissors for cutting the cord, and to avoid contact of the cord with soil.

758 Modern medicine will probably not be readily or
121 generally available to a majority of the residents of Bang Chan for many years to come. The first step toward better health in a village such as Bang Chan appears to be to teach the people, through their local leaders and practitioners, to adopt improved health practices. To be effective, such teaching must be based not only on a knowledge of what the people do, but on an understanding of the way they think and feel about customary practices.

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Introduction

121 This investigation was undertaken in connection with the Cornell Thailand Project, one of several studies under the auspices of the Department of Sociology and Anthropology which are focused on the process of cultural change. Bang Chan, the community chosen for intensive investigation, has been described previously (Sharp et al., 1953). The studies to be reported [Doi] herein were designed to contribute to a baseline description of the community culture and were carried out during the first and second years of a 5-year project, i.e. from September 1952-May 1954.

114 For the clinical examination of the school children and families, the research group consisted of Dr. Anusith Rajatasilpin, Miss Sapha Indrasud, Bua Srisuay, a local villager who assisted in many practical ways, and the author, who assumed major responsibility for planning and directing the work. Dr. Chumlong Kittiveja, of the Dental School, University of Medical Sciences, Bangkok, examined the teeth of the school children. Some data on sanitary practices were collected by Miss Saovanee Sudsaneh, in connection with the dietary survey.

121 The main investigations undertaken fall into two categories: 1) studies of nutritional status and 2) dietary studies, both qualitative and quantitative. In connection with both types of studies, information was collected concerning certain aspects of health and of sanitation in the village. Additional data concerning health practices, illness and death in Bang Chan were recorded by members of the Cornell research group in their field notes. This present report is concerned primarily with presenting findings from all of those sources regarding aspects of the health, sanitation and nutritional status in this rural Thai community.

Methods

Clinical Examination

125 Schedule. - In general, the clinical examination was directed toward discovery of signs and symptoms which might either be indicative of nutritional deficiency or of some disturbance which might be associated with or lead to nutritional deficiency. Certain items, such as cristal height, bicristal diameter, and age at menarche were included because information concerning them would contribute to our knowledge of norms for Thai people, and the clinical examination presented a good opportunity for obtaining such information.

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12 As advocad by the Joint FAO/WHO Expert Committee on Nutrition (1951), this study combined clinical appraisal with dietary surveys. The only laboratory tests done were for hemoglobin content of blood, and examination of stools for parasites. Suggestions for planning the schedule for the clinical appraisal were obtained from the report on the second session of the Joint FAO/WHO Expert Committee on Nutrition (1951), Nicholls (1951) and especially from Professor Dean Smith of the London School of Hygiene and Tropical Medicine (1952).

125 Choice of physical measurements, and of procedures in making them, were influenced by a tentative list of specifications for anthropometric measurement, developed by the Committee on Anthropometry, Food and Nutrition Board, National Research Council (1951).

The schedule used for clinical examinations, and a description of procedures used, are included in Appendix A.

Sampling. - All of the children attending the Bang Chan primary school were examined. Three or four children who were listed on the school rolls were not present at any time during the period when examinations were in progress, and were considered by the teachers as non-attending.

Persons in a random sample of households in 5 of the 7 hamlets in the Bang Chan community were also examined. The two most outlying hamlets were excluded from the population to be sampled because of the difficulty, during the dry season, in getting to them or having them come to us. Of 230 households in the 5 hamlets, 31 were included in the random sample. Age and sex distribution of the 166 persons in the sample were roughly similar to distributions for the approximately 1700 persons in the village as a whole, as determined in the census of December 31, 1953. Following is a summary of the age distribution:

[162] [62]

Age in Years	Bang Chan, 7 Hamlets	Random Sample, 5 Hamlets
0-14	38%	41%
15-19	11%	10%
20-59	44%	41%
60 and over	7%	8%

[162] The sample included one Muslim family of 13 members.

In the 31 households, 166 of 184 persons, i.e. 90% were examined. Of the 10% non-response group, half were unavailable, for example away at work when the examinations were in [123] progress. The remaining members of the non-response group

A A [See pp. 51-52--Analyst]

125 included adults of both sexes and some preschool children who
123 were unwilling to allow the physician to examine them. The small non-response group included persons of both sexes and a wide range of ages, and would therefore not be expected to bias the sample seriously. In general, rapport and cooperation were excellent.

Reproductive Function in Females

[145] Information concerning menstrual history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 35).

Information on child-bearing history was obtained from women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 36).

Illness and Injury

12 Evidence concerning the nature and extent of illness and
[164] injury in Bang Chan was obtained from various sources:

1) direct observation by the physician at the time of the physical examination, or when the physician was asked to visit a sick person in the village;

2) field notes in which information concerning illnesses, accidents and deaths were recorded as research workers learned of them; and

3) information obtained by structured interview in connection with surveys conducted by various persons working on the Cornell Thailand Project.

Adults in households which were included in the random sample were asked after the clinical examination whether any family member had been ill or injured during the past year. If so, the interviewer asked the nature of the illness or injury and what was done. The portion of schedule 6 which relates to this is included in Appendix A.

Some questions on illness were included in a survey of household heads in Hamlet KY-7 (Hanks, 1954) and in a structured interview to which there were 335 respondents from the

A [see pp. 51-52--Analyst]

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12 total of 336 households in Bang Chan (Ralis, 1955).[1] Appropriate portions of schedules used are included in Appendix A. A A

Women in the random sample of village households, and women whose young children were included in the child feeding study, were asked about survival of all children born to them (See Appendix A, schedule 3, item 36). With the exception of a few old women, those who reported that one or more children had died, were asked to describe the child's symptoms and the circumstances surrounding the death. When the description was clear enough to permit diagnosis, the physician recorded cause of death, as well as the informant's description.

Sanitation

Information concerning toilet practices was obtained from adult members in 30 of the 31 families included in the random sample of households. Additional information on toilet care of infants and toilet behavior of preschool children was recorded in field notes.

In connection with a weighed dietary survey, the observers noted practices relating to care of food, disposal of garbage, and source and treatment of drinking water, in 11 households on 4 days each throughout a year.

Schedules or portions of schedules used in recording the information on sanitation are included in Appendix A.

Results

Physical Measurements

141 145 Heights and Weights. - Mean values and ranges for heights, cristal heights and bicristal diameters, and both mean and median values and ranges for weights of boys and girls in the Bang Chan primary school are classified by age,

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[592] 1. In Ralis' survey, each "kitchen-unit" was considered as a household. As generally used in this data paper, "household" includes all persons living under one roof. A number of such households in Bang Chan include more than one kitchen-unit.

A A [see pp. 51-52--Analyst]

in Tables 1 and 2.[1]

Heights of children in the Bang Chan elementary school were, on the average, less than mean heights for Thai children given by Yong Chutima (Chutima, 1939). They are much below the mean heights at various ages, from charts (Class II) in use at the Dept. of School Hygiene, Bangkok.[2] Curves for mean weights of children in Bang Chan cross Dr. Yong's average curves, but are well below the average curves for girls and boys in Class II, School Hygiene charts (Figures 1 and 2). When compared with mean weights for children of the same height and age, from tables in use at the Dept. of School Hygiene, however, the two curves are seen to be similar (Figure 3). Mean heights and weights for rural children as reported by Zimmerman (1931) are not very different from those in Bang Chan.

In general, Thai children are shorter and weigh less than western children of the same age. For example, at all ages, mean heights and median weights[3] for both boys and girls in Bang Chan fell below the 10th percentile of the Iowa school children whose measurements are reported by Stuart and Meredith (1946) (Table 3). Weight of clothing was probably about the same for the two groups. In general, the median weight for a given age, in Bang Chan, corresponds to the weight of the 50th percentile for Iowa children 2½ to 4½ years younger. Thus the median weights for 8 year old boys and girls in Bang Chan, were similar to the weights of the 50th percentile of Iowa boys and girls 5 to 5½ years old, and the median weights of 13 year old boys and girls in Bang Chan were similar to weights of the 50th percentile of Iowa boys and girls at 10 and 9½ years of age, respectively. The tallest and heaviest boys and girls of these ages in Bang Chan were shorter and lighter than the corresponding median values for Iowa school children. On the average, however,

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1. Median weights are generally considered to be more representative of a group, but mean values are included as well, for comparison with results of certain other studies.

2. Unpublished data, based on measurements of over 15,000 children, both urban and rural, made over a period of years, and compiled by Dr. Laong. Furnished through the courtesy of Dr. Ladda of the Dept. of School Hygiene, Bangkok. Subjects were grouped as Classes I and II, of which roughly 1/3 were considered Class I.

3. Most of these observations were made in November or early December, 1952. On the basis of subsequent observations, many children were found to weigh less in May than during the previous February, but weight gains were again observed the following August and November.

TEXT CONTINUED ON PAGE 15

[see pp.9-13-An.] [see p. 14-An.]

Table 1

Heights, Weights, Cristal Heights and Bicristal Diameters of 116 Male Children in Bang Chan Primary School, 1952-53, Classified by Age.

Age[1], Years	No. of Persons	Height		Weight[2]			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		cm.	cm.	kg.	kg.	kg.	cm.	cm.	cm.	cm.
7	5	111.5	106.5-114.0	18.1	18.75	15.5-19.25	64.0	60.5-67.5	19.3	18-20.5
8	19	113.6	106.0-123.5	19.5	19.75	16.0-23.0	64.4	59.5-70.0	19.5	18-20.5
9	9	115.8	109.0-124.5	20.0	19.50	16.5-25.25	66.3	61.5-73.5	19.4	18-22.0
10	22	121.9	113.5-130.75	22.7	22.25	18.0-29.0	70.1	62.0-76.5	20.2	19-22.0
11	24	125.0	116.0-132.5	23.8	23.75	19.0-30.0	72.9	63.5-80.0	20.7	18-23.0
12	18	129.2	119.5-141.0	26.2	25.25	22.0-34.0	76.3	68.5-87.0	21.2	18-24.0
13	18	138.9	126.5-151.5	31.8	32.75	23.0-41.75	82.3	74.5-94.0	23.2	21-25.5
14	1	131.5		29.0	29.00		76.0		22.0	

1. Age to nearest birthday. For 3 boys in the school, age was uncertain, therefore their measurements were excluded from these averages.

2. For children weighing 22.75 kg. or more, weight of clothing was about ¼ kg.; clothing of smaller children weighed less than this.

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Table 2

Heights, Weights, Cristal Heights and Bicristal Diameters of 109 Female Children in Bang Chan Primary School, 1952-53, Classified by Age.

Age[1], Years	No. of Persons	Height		Weight[2]			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		cm.	cm.	kg.	kg.	kg.	cm.	cm.	cm.	cm.
7	8	109.0	106.5-114.0	16.9	17.4	15.0 -18.75	61.0	58.0-65.0	18.8	18.0-20.0
8	15	113.5	103.0-125.0	19.2	19.8	14.5 -24.25	64.7	56.0-74.5	19.5	18.0-21.0
9	9	118.3	114.5-125.0	22.1	22.0	20.25-26.50	67.8	66.0-70.0	20.1	18.0-22.0
10	12	121.6	113.5-134.5	22.5	22.0	19.0 -29.75	71.0	67.0-82.0	20.3	19.0-22.0
11	24	126.9	117.5-141.0	24.7	24.4	18.5 -30.5	74.5	62.5-85.0	21.3	19.0-23.0
12	21	133.3	124.5-150.5	28.2	28.0	22.0 -38.0	79.1	72.5-87.5	22.4	20.0-25.0
13	18	137.1	126.5-146.0	30.8	30.4	21.0 -37.25	81.6	70.0-90.0	22.8	19.5-26.0
14	2	137.7	133.0-142.5	32.9	32.6	31.75-33.75	80.5	76.5-84.5	21.5	19.5-23.5

1. Age to nearest birthday. For 5 girls in the school age was uncertain, therefore their measurements were excluded from these averages.

2. For children weighing 22.75 kg. or more, weight of clothing was about ¼ kg.; clothing of smaller children weighed less than this.

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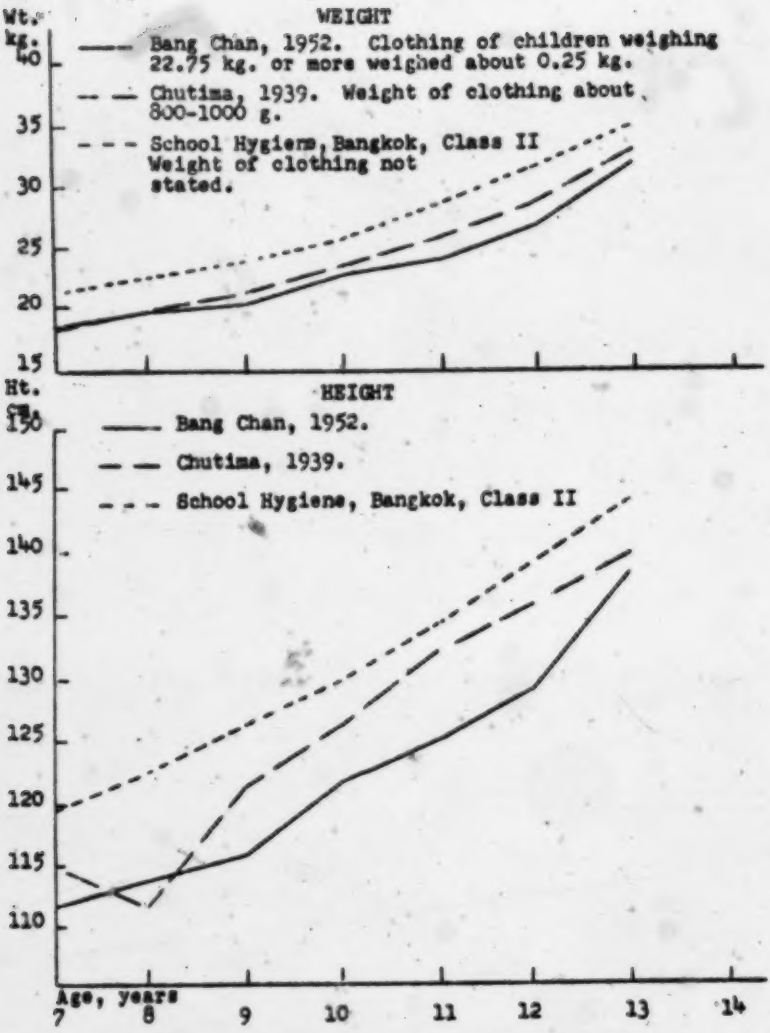

Figure 1. Mean heights and weights of boys in Bang Chan elementary school, compared with mean heights and weights of Thai children as reported by others.

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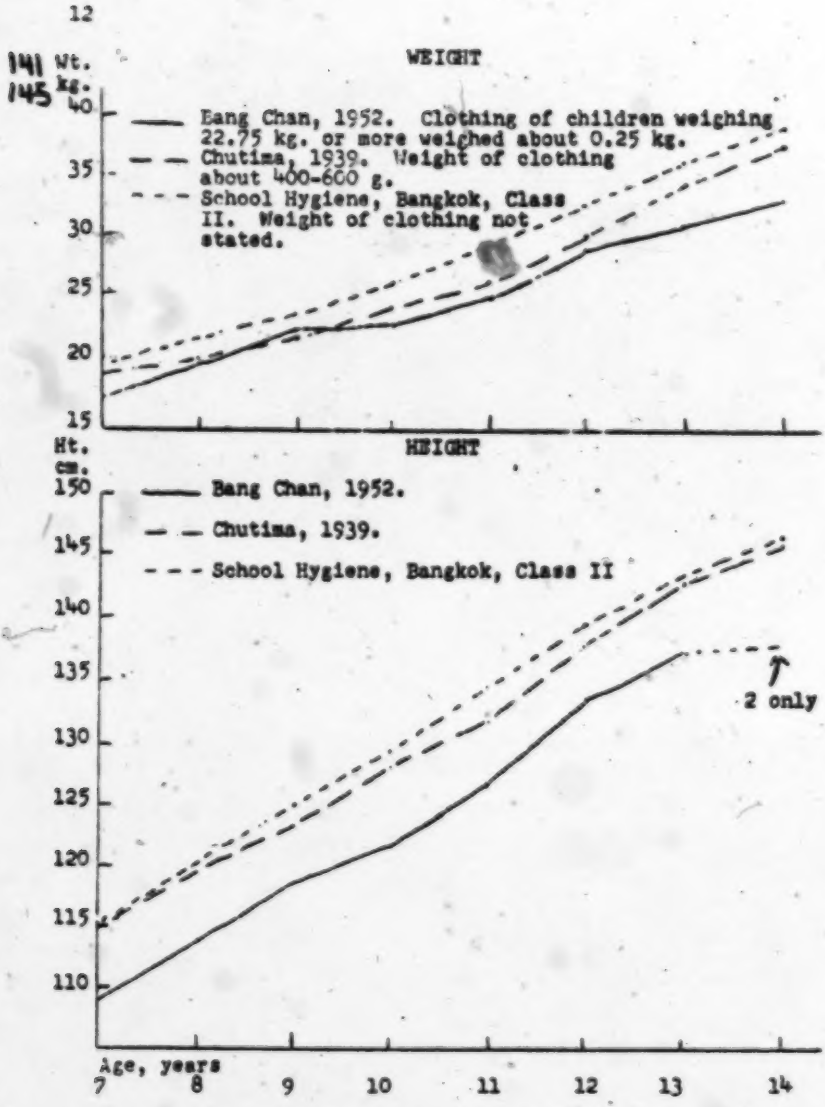

Figure 2. Mean heights and weights of girls in Bang Chan elementary school, compared with mean heights and weights of Thai children as reported by others.

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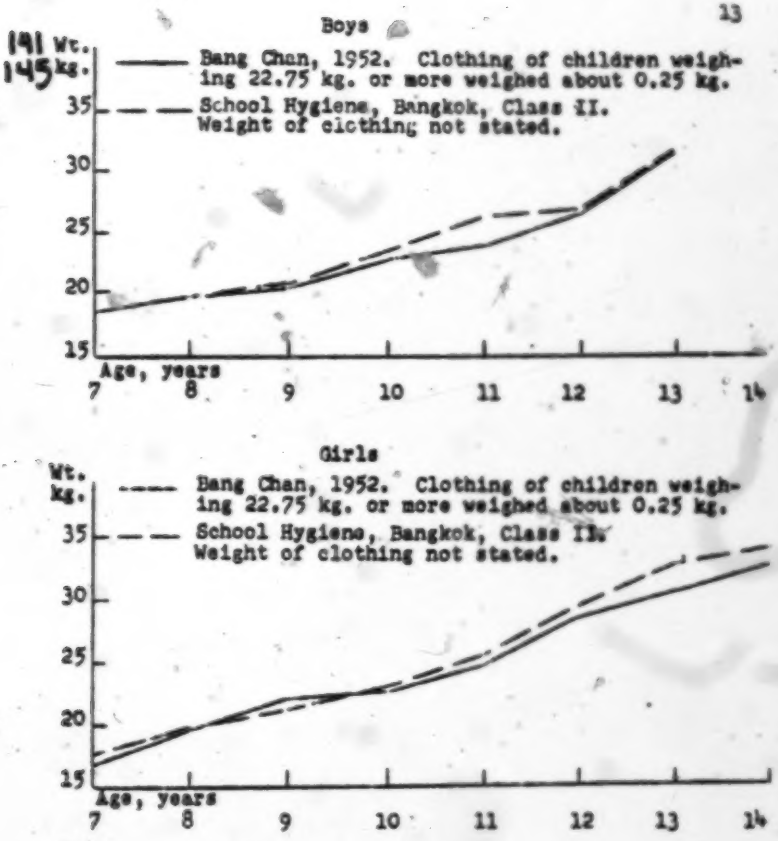

Figure 3. Mean weights of boys and girls in Bang Chan elementary school compared with mean weights (Class II) for children of the same height and age, in table used at Department of School Hygiene, Bangkok.

Table 3

Heights, Weights and Bicristal Diameters of Children in Bang Chan Elementary School, Compared to Measurements of American School Children (Stuart and Meredith).

	Age[3]	Bang Chan				Stuart and Meredith[1]		
		Height		Wt.[2]	Bicr. diam.	Percentile 10		
		Mean	Range	Med.	Mean	Ht.	Wt.[4]	Hip Width
		cm.	cm.	kg.	cm.	cm.	kg.	cm.
Boys	8	113.6	106.0-123.5	19.75	19.5	123.1	23.2	19.2
	11	125.0	116.0-132.5	23.75	20.7	137.3	30.1	21.1
	12	129.2	119.5-141.0	25.25	21.2	142.4	32.7	21.9
	13	138.9	126.5-151.5	32.75	23.2	146.6	34.9	22.7
Girls	8	113.5	103.0-125.0	19.75	19.5	122.1	22.0	19.1
	11	126.9	117.5-141.0	24.4	21.3	137.0	28.4	21.4
	12	133.3	124.5-150.5	28.0	22.4	142.6	31.5	22.4
	13	137.1	126.5-146.0	30.4	22.8	149.1	36.2	23.6

1. H. C. Stuart and H. V. Meredith (1946).
2. Includes small amount of clothing, weighing on the average about ½ kg. for the 11-13 year old children.
3. Ages 8, 11-13 chosen for comparison because for each age from 15-24 children of each sex had been measured.
4. Weight in pounds changed to kg. Children were weighed in light socks, shorts, and for older girls, brassieres.

5: Hauck et al. D-5 (1952-1954) 1956 AO7 Central Thai AO7
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141 145 Bang Chan children could not be considered as markedly underweight. Few were so thin that one could "count their ribs" and still fewer would be considered plump by American standards.

141 Heights and weights of males and females over 7 years of age[1] in the family survey are summarized in Tables 4 and 5. The height of the tallest man in the random sample was 172.5 cm. (67.9 inches) and that of the shortest, 150.5 cm. (59.3 inches). The height of the tallest woman measured was 159 cm. (62.6 inches), but one 16-year old girl, the daughter of the tallest man in the random sample, was taller, 161 cm. (63.4 inches). The height of the shortest adult woman measured was 142.5 cm. (56.1 inches). Mean heights for men and women 20 years of age or older, in the random sample were 158.6 cm. (62.4 inches) and 151.3 cm. (59.6 inches) respectively.

The weight of the heaviest man in the random sample was 69 kg. (151.8 pounds) and that of the heaviest woman was 70 kg. (154 pounds).

Mean weights for men and women in the random sample were 53 kg. (116.6 pounds) and 45.3 kg. (99.7 pounds) respectively. Note that, in general, differences are slight between mean and median weights for age and sex groups including a number of individuals. The group of 6 men over 60 years of age is an exception, as values for two individuals weighing 66 and 69 kg. respectively raise the mean markedly. An even wider range of weights occurred in the group of women 60-81 years of age, but the influence of one high weight (70 kg.) was offset by a correspondingly low weight (27 kg.). Thus the tendency noted among western populations, for mean weight to exceed the median weight for a given age and sex group, was not apparent in the population of Bang Chan.

141 145 Girls in Bang Chan may have reached adult height and weight by age 20, since the small differences in the averages for ages 15-19 (mean age 17 years) and the successively older age groups are probably associated with individual variation and the small numbers in each group (Table 5). Note that, in general, Bang Chan women did not appear to increase in weight with age, after adult stature is reached. Zimmerman (1937) states that Thai females reach maturity of height at age 17. Mean values from School Hygiene tables are similar, for heights of school girls 17 or 18 years of age and older, and mean weight increases from 17 years on are in the neighborhood of 1 or 2 kg. Mean heights for adult women in the random sample of households in Bang Chan are slightly below those recorded by other observers (Table 6).

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1. Measurements of preschool children are included in Appendix B, Table 19.

[see p.17-An.] [see p. 18-An.] [See p. 67-an.]

S: Hauck et al. D-5 (1952-1954) 1956 AO7 Central Thai AO7

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Table 4

Summary of Heights, Weights[1], Cristal Heights and Bicristal Diameters of 62 Males Over 7 Years Old, in the Random Sample of Village Households, Bang Chan, 1952-53

Age	No. of Persons	Height		Weight[1]			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		cm.	cm.	kg.	kg.	kg.	cm.	cm.	cm.	cm.
8	1	112.0		17.5	17.5		64.0		18.5	
9	1	113.5		19.5	19.5		63.0		20.0	
10	3	121.7	120.5-122.5	23.4	23.5	22.25-24.5	69.7	68.5-70.5	20.0	19-21
11	2	129.5	129.0-130.0	26.3	26.3	25.0 -27.5	77.0	75.0-79.0	21.5	21-22
12	5	130.8	119.5-137.5	27.3	28.3	22.0 -31.0	77.3	69.5-84.5	20.8	18-23
13	2	145.8	140.5-151.0	35.8	35.8	33.25-38.25	86.3	82.0-90.5	25.0	25-25
14	2	149.0	145.0-153.0	38.0	38.0	34.0 -42.0	85.5	85.0-86.0	22.5	22-23
15-19	9	153.8	141.5-167.0	45.1	45.8	35.75-53.25	91.4	82.5-101.0	25.4	24-27
20-39	20	157.5	152.0-171.0	51.8	52.0	42.5 -58.5	91.4	86.5-99.0	26.5[2]	24-28
40-59	11	160.6	151.5-172.5	54.9	55.0	45.5- 61.0	93.1	86.0-101.5	27.7	24-29
60-66	6	158.0	150.5-172.5	53.4	49.8	43.0 -69.0	91.6	86.0-101.0	27.9[2]	25-30
Partial Total 20-66	37	158.6	150.5-172.5	53.0	52.0	42.5 -69.0	91.9	86.0-101.5	27.1	24-30

1. For children weighing 22.75 kg. or more weight of clothing was about 0.25 kg., clothing of smaller school children weighed less than this. Clothing of adults weighed about 0.25 kg.
2. Measurement was not obtained for 1 person in this group.

Table 5

Summary of Heights, Weights[1], Cristal Heights and Bicristal Diameters of 70 Females Over 7 Years Old, in the Random Sample of Village Households, Bang Chan, 1952-53

Age in Years	No. of Persons	Height		Weight[1]			Cristal Height		Bicristal Diameter	
		Mean	Range	Mean	Median	Range	Mean	Range	Mean	Range
		cm.	cm.	kg.	kg.	kg.	cm.	cm.	cm.	cm.
8	4	112.4	100.0-117.0	18.2	19.6	13.0 -20.5	63.1	56.0-66.0	19.4	18.0-20.5
10	4	124.0	120.0-126.5	24.1	23.6	19.75-29.5	71.9	67.5-75.0	19.8	18.0-21.0
11	2	122.3	120.0-124.5	23.1	23.1	22.0 -24.25	71.5	69.0-74.0	21.0	20.5-21.5
12	3	135.3	127.0-140.5	29.7	30.5	27.75-30.75	79.0	75.5-81.0	22.0	21.0-23.0
13	3	142.0	138.5-145.5	34.9	36.0	32.25-36.5	85.8	84.5-87.5	21.7	21.0-23.0
14	1	142.5		33.8	33.8		84.5		19.5	
15-19	8	151.3	143.5-161.0	45.4	45.5	40.0 -50.5	90.0	85.0-96.0	25.8	23.0-27.0
20-39	21	150.1	142.5-158.0	45.9	47.0	32.5 -58.0	87.2	81.5-96.5	26.3[2]	22.0-31.0
40-59	16	150.3[2]	143.5-157.0	44.0	43.0	37.0 -55.5	87.8	78.0-93.5	26.9	23.0-29.5
60-81	8	151.4	146.0-159.0	46.0[2]	46.3	27.0 -70.0	88.1[2]	84.0-93.0	28.0[2]	24.0-30.0
Partial Total 20-81	45	151.3	142.5-159.0	45.3	45.7	27.0 -70.0	87.6	78.0-96.5	26.7	22.0-31.0

1. For children weighing 22.75 kg. or more weight of clothing was about 0.25 kg; clothing of smaller school children weighed less than this. Clothing of adults weighed about 0.25 kg.
2. Measurement not obtained for one person in this group.

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Table 6

141 Mean Heights and Weights of Women in Random Sample of Village Households, Bang Chan, Compared to Heights and Weights of Thai Women as Reported by Other Observers.

	No.	Ages	Mean Height	Mean Weight[1]
			cm.	kg.
Women, Bang Chan	8	15-19 (Av. 17)	151.3	45.4
	45	20-81	151.3	45.3
Nurses, Siriraj Hospital[2]	198	17-26	152.6	47.5
Medical Students[2]	14	17-25	154.7	44.5
School girls[3]	76	19	152.0[4]	46.9[4]
School girls[3]	48	20	151.9[4]	47.4[4]
Laborers, Huahin Ry. Freight Service	32	20-40	156.2	49.9
Rural Women[5]	113	20-39	151.7	47.0

1. Clothing of women in Bang Chan weighed about 0.25 kg., and that of nurses about 0.5 kg. No estimates were given of weight of clothing of women in the other groups.

2. Chutima, 1939.

3. From tables in use at Dept. of School Hygiene, Bangkok.

4. Means for 2 groups classified on basis of physical status, but evidently not height or weight.

5. Calculated from figures given by Zimmerman, 1937.

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Among the men and boys in the random sample of households, however, mean height and weight was distinctly less for the age group 15-19 (mean age 17) than for the older age groups (Table 4), and mean height and weight increased with age among the subgroups. Thus mean height of 4 boys 18 and 19 years old was 157.6 cm., and mean weight 50.2 kg. as compared to 150.1 cm. and 38.5 kg. for 4 boys aged 15-16. Among the 20 men in age group 20-39, 3 were age 20, and 4 either 23 or 24. Mean heights for both of these subgroups were 157 cms. The number of young men examined in Bang Chan is too small to permit judgment as to when adult stature is attained. On the basis of measurements of Siamese males, from the medical service of the Royal Siamese Navy, Dr. Yong concludes that "growth, as regards both height and weight stops at age 22" (Chutima, 1939). According to Zimmerman (1937) rural Siamese boys increase in height steadily until about 19 years of age, at which time they seem to have reached maturity. Adult men in Bang Chan were on the average a little shorter than other groups of Thai men whose measurements were available to us (Table 7).

Bicristal Diameter. - Some additional information concerning body build is obtained from this measurement. In general, for Bang Chan children of elementary school age (Tables 1 and 2), mean bicristal diameters correspond to hip widths for Iowa school children one to three years younger (Stuart and Meredith, 1946). Mean bicristal diameters of adult men and women in Bang Chan (Tables 4 and 5) correspond approximately to the values for the 10th percentile of the 18 year old boys and girls in the Iowa study. Andrews (1943) found the hip breadth of Central Thai men to be 26.98 ± 1.48 cm., which is similar to the mean of 26.9 cm. for 31 adult males, aged 20-59, in Bang Chan.

Cristal Height. - At the time this study was undertaken, the Committee on Anthropometry of the Food and Nutrition Board, National Research Council had tentatively recommended cristal height as an additional measurement pertaining to the long dimension of the body. Mean values and ranges, for various age groups, are presented in Tables 1, 2, 4 and 5.

Dental Status

A dentist examined the teeth and mouths of 226 school children, 7 to 14 years of age, in good natural light, using mouth mirror and probe. Teeth of persons in the random sample of village households were inspected by the physician in the course of the clinical examination. Data on dentition and dental health were analyzed by Kamalanathan (1956).

As noted by the Joint FAO/WHO Expert Committee on

[TEXT CONTINUED ON PAGE 21]

[see p.: 16; 20; 9-13; 16, 17; 9-13, 16, 17]

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Table 7

141 Mean Heights and Weights of Older Boys and Men in Random Sample of Village Households, in Bang Chan, Compared to Heights and Weights of Older Boys and Men as Reported by Other Observers.

	No.	Ages	Mean Height	Mean Weight[1]
			cm.	kg.
Older boys, Bang Chan	9	15-19	153.8	45.1
Men, Bang Chan	37	20-66	158.6	53.0
Royal Agricultural College, North Siam[2]	302	17-24	164.5	55.6
Soldiers[2]	46	21	165.5	55.9
Medical students, Chulalongkorn University[2]	83	18-26	165.4	55.3
Convicts, Southern Penal Colony[2]	124	21-40	164.0	55.1
Students[3]	285	19	162.8	50.75[4]
Students[3]	50	21	164.2[4]	52.0[4]
Central Thai[5]	about 950	20+ mean 32.6	163.5± 5.44	53.48
Men, rural areas[6]	478	20-84	162.3± 5.43	54.05± 6.39

1. Clothing of men in Bang Chan weighed about 0.25 kg. and of the Central Thai studied by Andrews weighed approximately 0.5 kg. No estimates were given of weight of clothing of men in the other groups.

2. Chutima, 1939.

3. From tables in use at Dept. of School Hygiene, Bangkok.

4. Average for figures for 2 groups, classified on the basis of physical status, but evidently not height or weight.

5. Andrews, 1943.

6. Zimmerman, 1937.

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As noted by the Joint FAO/WHO Expert Committee on 21

Nutrition (1951) the part played by diet in the production of tooth which are unduly susceptible to caries is still controversial, although in general, the importance of nutrition, especially in the formative period, is widely accepted. In accordance with the recommendation of this Committee, caries rates are recorded as a separate item, and are not taken as a criterion of malnutrition.

Dentition. - Median ages of eruption of specific permanent teeth in 240 Bang Chan children, ages 7 to 14, are shown in Table 20 (Appendix B). For this purpose, data on 226 children in the Bang Chan primary school, and 14 additional children between these ages, in the random sample, were included. The percentage of boys and girls at each age, having each specific tooth erupted, was calculated. Median ages of eruption were estimated according to the method suggested by Klein et al. (1937). A graph was drawn for each kind of tooth, for each sex. Cumulated percentages for each specified kind of tooth erupted were represented on the x axis and age in years at one year intervals on the y axis. Median age of eruption was estimated by determining the point at which the age percentage eruption curve cut the 50% perpendicular.

In Bang Chan, as elsewhere, the median age of eruption for specific teeth is lower for girls than for boys. In some cases the difference is slight, in others, from several months to more than a year. The difference is most marked for lower canine teeth.

The average number of teeth, deciduous, permanent and total, at each age, is shown for children 7 to 14 years of age, in Table 21 (Appendix B). For ages 8 to 13, the greater dental maturity of girls than boys is reflected in the larger average number of permanent teeth present at each age.

On the basis of median ages of eruption for specific teeth, and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan appeared to be approximately the same as for children in other regions, in both eastern and western hemispheres, with which they were compared. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent (Kamalanathan, 1956).

Caries Incidence. - Caries incidence was found to be low among Bang Chan children as compared to many regions in which surveys have been made. Of 226 children examined by the dentist, 42% (45% of the boys and 38% of the girls) were totally free of caries. When all carious teeth, both deciduous and permanent, were included, the average number of carious teeth per child was 1.8 (1.6 for boys and 2.0 for girls).

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164 Considering deciduous teeth only, in a group of 173 children, 93 boys and 80 girls who had deciduous teeth, 56% of the boys and 50% of the girls were free from caries. The average number of carious deciduous teeth per child was 1.4 and 1.5 for boys and girls respectively. For those with caries experience, the number of carious deciduous teeth per child was 3.2 for both boys and girls.

In the entire group of 226 children, 76% of 116 boys and 60% of 110 girls were free from caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the 30 boys with caries of permanent teeth had more than 4 such teeth, whereas 5 of 43 girls had more than 4 carious permanent teeth.

164 171 Data for children aged 12 to 14 in Galesburg, Illinois and Colorado Springs (Dean et al. 1942) have been chosen for comparison of caries experience in permanent teeth, with that in Bang Chan. In these cities, the fluoride content of the water is conducive to low caries incidence, yet the percentage of children aged 12 to 14 having caries experience was 72.2 and 71.5 for Galesburg and Colorado Springs, respectively as compared to 41% for Bang Chan, and the number of DMF[1] permanent teeth per child was 2.36 and 2.46 as compared to 0.88 carious permanent teeth per child in Bang Chan.

The reason for the relatively low incidence of caries among children in Bang Chan cannot be stated with certainty. Similarly low or even lower caries incidence has been reported for certain age groups of children in various parts of the world, for example in North China (Afonsky, 1951), in the northern islands of Samoa where the people had little access to store foods (Lösee, 1952) and in a small isolated village in Greece [146] (Phillipas, 1955). One thing which residents of Bang Chan appeared to have in common with such other populations which are relatively caries free, was low intake of sugar[2], particularly in a form which would be apt to adhere to the teeth.

757 Restoration of Decayed and Missing Teeth. - None of the children examined had any filled teeth. Up to 44 years of age, the adults examined had retained almost all of their teeth, and [145] no evidence of restoration, other than crowning was noted. Decline in average number of teeth was marked after age 55.

Of 92 adults with teeth, at least 7 men and 6 women had been to a dentist as evidenced by the presence of crowned teeth

1. DMF denotes decayed, missing and filled. Children in Bang Chan had no filled teeth.

2. Sudsaneh (1956) found the average per capita intake of sugar in 11 families to be only 6 grams per day.

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757 in their mouths. More than half of the teeth crowned were said to have been sound, and no crowned molars were noted. The services of a dentist appear to have been sought more for their cosmetic value than for dental care as such.

276 164 Betel Chewing and Dental Health. - Betel chewing was not habitual with any of the adults under 25 years of age who were examined. Among adults above this age in the random sample, 13 of 29 men, or 45%, and 34 of 40 women, or 85% chewed betel. The group of adults from 25 to 44 years of age was singled out for study of caries incidence in relation to betel chewing, since adults retained most of their teeth up to this age. Among 19 betel chewers, 3 persons had 5 defective teeth whereas among 19 non-betel chewers, 7 persons had 46 defective teeth. Others (Gerry et al. 1952; Shouric, 1948) have reported a lower incidence of caries among betel chewers than non-chewers. Caution must be used in interpreting our observations, however, because the sample is small, and the teeth were not cleaned before counting caries. Stain and calculus may have obscured small caries in betel chewers.

The impression was gained by casual observation that protruding incisors were common among habitual betel chewers, and that the teeth of some betel chewers appeared to be loose. Since such protruding incisors were not noted among the school children, nor among non-chewers, we associated them with habitual betel chewing. Both Gerry et al.(1952) and Balendra (1949) noted a higher incidence of gingivitis among betel chewers than non-chewers. Since most of the older persons in our sample chewed betel, our data offered no clue as to the possible effect of betel chewing on the loosening and loss of teeth among older persons. Another item of possible importance, and on which we have no data, is the extent to which tobacco is used as an ingredient of the mixture which is spread on betel leaves.

276 146 Platt (1945) considered betel chewing as a potential source of calcium in the diet. He stated that the amount and utilization of calcium ingested with 6 betel leaves was similar to that from 10 ounces of cow's milk.[1]

The amount of calcium ingested in this way doubtless varies not only with the frequency of betel chewing, but also with the amount of juice swallowed. In Bang Chan, spitting out the juice appeared to be more customary than swallowing it.

276 Further research is needed to decide whether the potential disadvantages of betel chewing outweigh its potential benefits. Moreover in any attempt to decrease the practice of betel

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1. Platt, 1945. Footnote, p. 21.

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276 chewing, the extent to which the betel leaves and areca nuts are associated with festival occasions must be taken into consideration. Betel chewing was forbidden in Thailand by the Thai government but the enforcement of this regulation proved impossible and it has been forgotten since World War II.

Nutritional Status

180 125 Incidence of Anemia. - Hemoglobin was determined by means of a Spencer Hb-meter. About 9% of the school children had hemoglobin values below 11.5 g. per 100 ml. but one value only was below 9.75 g. (Table 8). As might be expected since none of the girls in the primary school had passed the menarche, no difference was apparent between values for boys and girls.

Table 8

147 Hemoglobin Values of 233 Children, Ages 7-14, in the Bang Chan Primary School, 1952-53

	Number of Children	Hemoglobin, grams per 100 ml.					
		Under 9.75	9.75-11.5	11.75-12.5	12.75-13.5	Over 13.5	Not Ascertained
Boys	121	0	10	32	44	33	2
Girls	112	1	10	25	38	37	1
Total	233	1	20	57	82	70	3

In the group of persons 15 years and older, in the random sample of village households, the usual difference in hemoglobin values between males and females is evident (Table 9). About 6% of the males and 25% of the females had hemoglobin values of 11.5 g. or less/100 ml. with one only below 9.75 g. Many of these might be considered as borderline rather than anemic.

A [see p.25-Analyst]

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Table 9

147 Hemoglobin Values of 104 Residents, Age 15 and Older, in Random Sample, Bang Chan, 1952-53

	Number of Persons	Hemoglobin, grams per 100 ml.					
		Under 9.75	9.75-11.5	11.75-12.5	12.75-13.5	Over 13.5	Not Ascertained
Male	48	0	3	7	9	28	1
Female	56	1	13	10	14	11	7
Total	104	1	16	17	23	39	8

146 125 Occurrence of Possible Signs of Malnutrition. - Most of the signs and symptoms included on the schedule for clinical examination were those known to be of value in the assessment of nutritional status (Joint FAO/WHO Expert Committee on Nutrition, 1951). Some items included need to be investigated more fully before their value can be determined. Among the 146 164 items on the schedule, (Appendix A) the following were not observed in any of the persons examined:

Eyes: photophobia, lachrymation, blepharitis, xerophthalmia, Bitot's spots, gross corneal vascularization.

Face: Folliculosis, nasolabial seborrhoa, dyssebacia, suborbital pigmentation.

Lips: Scars of cheilosis and of angular stomatitis.

Tongue: Edema, color change to scarlet or magenta. (In 30 adults, however, such color changes if present would have been obscured by the discoloration from betel chewing.)

Gums: Retraction, loss of interdental papillae.

Parotid glands: Enlargement.

Skin: Perifollicular congestion, petechiae.

Edema

Calf tenderness

Inability to rise from squatting [see p. 51-Analyst]

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In addition, the two cases of symmetrical dermatosis observed were not of the pellagroid type and should probably not have been included with the possible signs of nutritional deficiency.

The only instance of thyroid enlargement noted (an obvious thyroid adenoma) was in a 13 year old boy who had always lived in Bang Chan. He knew of no one else in the family with such enlargement.

Five girls and women in the random sample refused to permit the examining physician to palpate the liver and spleen, but he was able to carry out the rest of the inspection.

Almost half of the groups examined, 46% of the school children and 47% of the family sample, were free of the possible signs of nutritional deficiency. The remainder had from 1 to 7 such signs. Persons in the random sample were grouped according to age, and the percentage of each group found to have each number of signs is shown in Table 10. Note that most of the

Table 10

Number of Possible Signs of Nutritional Deficiency Occurring in 166 Individual Residents in the Family Survey, Grouped According to Age

Age Group, years	Number of Persons Examined	Percentage of Each Group Found to Have Each Number of Signs			
		0	1	2	3 or more
6 and under	33	94	3	3	0
7-14	34	47	38	9	6
15-19	17	76	18	6	0
20-39	41	32	54	7	7
40-59	27	7	33	22	37
60 and over	14	21	7	21	50
Total Group	166	47	30	10	13

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preschool children were free of signs. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Among the children, a larger proportion of school children than preschool children or adolescents had possible signs of malnutrition; i.e., more than half of the children 7-14 years of age, as compared to 6% of the children 6 years old or under, and 24% of the age group 15 to 19 years.

The incidence of specific signs among school children and persons in the random sample of families, is summarized in Table 22 (Appendix B).

Several points concerning the distribution of specific signs possibly associated with nutritional deficiencies deserve comment. The most prominent group of signs among school children were the skin signs: xerosis which occurred in 15% and phrynoderma in 5% of the children. Even loss of elasticity of skin occurred in 3 boys. Among adults, these signs were confined almost wholly to the group of older women.

Liver enlargement was next in frequency among school children, with 9% of them exhibiting this sign. We have no evidence as to the cause of liver enlargement. It is sometimes associated with protein deficiency, but our data on food intake (Sudsanoh, 1956) is on the basis of family consumption, hence we do not know whether school age children have relatively low intakes of total protein or of animal protein. Liver enlargement may also be associated with intestinal parasitism, which was common in Bang Chan.

Dry, "staring" hair was observed in 18 children. One case of diminution of pigment was recorded. A number of other cases in which dark hair had an auburn cast, were noted by the non-Thai nutritionist, but were accepted as normal hair color by the Thai physician.

Ulcers on the legs below the knees were observed in 14 school children. Such ulcers, though not associated with any specific nutritional deficiency, occur commonly in ill-nourished subjects (Smith, 1952).

Some school age children both in the random sample and in Bang Chan primary school, did not have knee and/or ankle jerk. These signs were more prominent among adults, however, particularly among men, than in the school age group.

The occurrence of skin changes among older women, together with the higher incidence of low hemoglobin values among women than among men, accounts for the seemingly higher incidence of possible signs of malnutrition among adult women than men. The only clear difference in occurrence of signs among

[see p. 67 - Analyst]

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146 164 women of childbearing age as compared to older women, was in the incidence of skin changes. Certain of these, i.e. xerosis, loss of elasticity and atrophic skin, were observed, in the adult group, only among older women. In some cases at least these signs may have been associated with aging rather than nutritional deficiency, unless, indeed some of the common signs of aging prove to be due to long continued intakes which are suboptimal. Among the school children, however, these skin changes were clearly abnormal.

At the clinical examination, redness of the gums was noted in a few cases only among school children, most of whom were examined in November. The dentist, who examined the children in February, noted redness of gums in about one-fourth of them. This difference may reflect a difference in standards used by the physician and dentist, or the incidence of this sign may have increased between examinations.

Certain groups of signs tended to occur together. Thus the various skin signs: phrynoderma, xerosis and loss of elasticity were often associated. Of 23 cases with absence of knee jerk, 16 had absence of ankle jerk also, and the various changes in tongue and lips not only tended to occur together, but these were often associated with absence of knee jerk and/or ankle jerk. The signs of possible nutritive deficiency most commonly noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine in the diet (Sudsaneh, 1956).

146 142 Bowleggedness was observed in a larger proportion of adults than children, but according to our criteria, did not occur in either group to the extent that we had been led to expect from previous reports. Among the 198 school children in Bang Chan who were examined by a physician in 1948-49, 69, i.e., about 35%, were reported to have bowed legs, with 4 cases called "severe" (Sharp et al. 1953, p. 249). Among the 233 children in Bang Chan school whom we examined, 9 only, i.e., less than 4%, were considered bowlegged according to our criteria, and none of these cases was severe. Chutina (1939) stated that "Another condition prevalent in Siam and fundamentally due to improper diets since infancy is bow-leggedness. Only about 25% have normal lower limbs, the rest being bowlegged and many are knock-kneed . . . The percentage of extreme bow legs is about 20% while mild bow legs form about 55% of our school children." Since these other observers determined bowleggedness by casual inspection[1], some of the difference between the earlier observations and ours may be due to difference in criteria used. The children

1. Personal communication from Dr. Yong Chutina.

146 pictured as bowlegged in Chutima's report (1939) are, however,
142 clearly so, and represent more extreme cases than we encountered among the children in Bang Chan in 1952-53. If the incidence of bowleggedness among children in Thailand is indeed decreasing, an investigation into possible causes of the change would be of interest.

142 To the nutrition specialist on the team, who was not Thai, the knee joints appeared to be large. Moreover, although the term "knock knees" was not included on the schedule, it was entered frequently by the physician under comments (Appendix B, Table 22).A Whether this condition is related to heredity,
[516] nutritional status, or to some other environmental influence such as the life-time habit of squatting on the heels, is not known.

146 The physician's estimate of general appearance and vitality were recorded early in the examination, before he sought for specific signs. About 80% of all persons examined were rated as "good," and less than 1% as "poor." About half of all persons rated as "good" in general appearance and vitality were without clinical signs, as compared to about 30% of those rated "fair." Of persons with 3 or more possible signs of malnutrition, however, about 2/3 were rated "good" (Appendix B, Tables 23 and 24).A As has been observed frequently, such a general appraisal is not correlated with the presence or absence of clinical signs possibly associated with malnutrition. Clearly, in Bang Chan, there is little or no malnutrition of the sort that causes marked apathy.

In summary, a variety of possible signs of malnutrition were noted both in the school children and the persons in the random sample of village households. More than half of the total number examined had one or more signs possibly due to malnutrition, but the only clearly defined deficiency disease encountered was one case of beri beri[1] in a 49-year old man.

Reproductive Function in Females

84 Menstrual History. - Information concerning menstrual
125 history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied.

145 Most of the women from whom information on age at menarche was obtained were under 40 years of age. A few could

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1. History of beribori among nursing mothers and their
[149] infants was obtained in several instances, and cases of beri-beri, in both sexes, were seen among persons not included in the population samples which were examined.

A [see p. 71-Am.] B [see pp. 72, 73-Analysis]

145 not recall the age at menarche.

The median and modal reported age at menarche was 15 years, with a range from 13-19 years (Table 11).

Table 11

Reported Age at Menarche of 94 Females in Bang Chan.

	Age in Years						
	13	14	15	16	17	18	19
Number at each age	6	18	34	21	8	4	3
Percentage at each age	6	19	36	22	9	4	3

This estimate, made from ages given by recall, is necessarily approximate; however, none of the girls between 12 and 14 who were examined clinically, had passed the menarche. Moreover, median and modal ages at menarche were 15 years for sub-groups aged 15 to 24, and 25 to 39 at the time of inquiry, hence the inclusion in this series of women for whom the event was not recent did not alter the estimated median age at menarche. Wilson and Sutherland (1953) conclude that in tropical countries the onset of menstruation as compared with that for English children, 145 may be either early or late. Tanner (1955) notes that if 114 climate has an effect on age at menarche, it must be a minor one, 121 and that at present the effect of race cannot be disentangled from nutritional and socio-economic circumstances. Basing his [146] judgment on the effects on man of famine associated with war, and on results of direct experiments on animals, Tanner expresses the conviction that nutrition plays a major role in determining the age at which menarche and the adolescent spurt in growth occur. If this view is correct, the relatively late median age of menarche in Bang Chan may be associated with inferior nutritional status.

145 One of 17 women in the age group 35-44 had passed the menopause, whereas 12 of 16 women over 45 years of age had done so. One of 7 women over 55 years of age, 2 of 7 women age 50-54, and one of 2 women age 45-49 had not yet reached the menopause. The reported ages at menopause were: 30-34 years, 2 women; 40-44 years, 3 women; 45-49 years, 3 women and 50-54, 5 women.

147 Approximately 100 respondents gave information concerning

duration and regularity of monstrual periods, and intervals between periods (Table 12).

Table 12

Characteristics of Monstrual Periods of Women in Bang Chan

	Percentage of Respondents in Each Category			
Duration, days	Under 3	3 or 3+(a)	4 or 4+(a)	5 or more
91 respondents	6	78	11	5
Interval	**Short**	**Usual(b)**	**Long**	
101 respondents	0	84	16	
Regularity		**Regular**	**Irregular**	
102 respondents		89	11	

(a) A plus sign indicates variability of period, as 3-4 days.

(b) usual - approximately 1 lunar month.

While the usual variations were encountered, a large majority of responses were similar. Thus the typical woman in Bang Chan monstruated at regular intervals of about 1 lunar month, for a period of approximately 3 days. While the sample is small, the only unusual feature of menstrual history as compared to western standards appears to be a somewhat older age at menarche.

Pregnancies. - Most married women in Bang Chan have children. The range in number of pregnancies for a given number of years of marriage is great, however (Table 13), and suggests either 1) relatively low fertility in many cases, or 2) the existence of some method of birth control of which the research workers, including the Thai physician, had no information. Zimmerman (1931, p. 230) has commented that in Thailand the birth rate did not seem to be under human control. He said that rural Thai did not know about birth control nor practice any form of it to any extent.

[see p. 32-Analyst]

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Table 13

163 Relation of Reported Number of Pregnancies[1] to Years of Marriage During the Child-bearing Period, for 77 Women in Bang Chan

Years Marriage During Child-bearing Period	Number of Women	Range, Number of Pregnancies	Total Pregnancies	Average No. Pregnancies Per Woman
2 or less	10	1-3	13	1.3
3-4	7	1-3	13	1.9
5-6	6	2-3	16	2.7
7-8	3	2-5	9	3.0
9-10	7	3-5	27	3.9
11-15	15	2-9	74	4.9
16-20	10	1-12	66	6.6
21-25	6	3-13	52	8.6
26-30	5	2-12	35	7
31 or more	8	3-14	52	6.5
Total 21 or more	19	2-14	139	7.3

1. 2 women, married 10 and 21 years respectively, who reported no pregnancies, were omitted from the tabulation. A few others could not be included because of inadequate information.

All but one of the 84 mothers surveyed had living children at the time of interview. One woman, aged 23, had been pregnant 5 times in 5 years of marriage, with 1 miscarriage, 1 death in utero, and 1 stillbirth. The 2 children born alive to this mother were considered by the interviewing physician as probably premature, and were classified as dying because of "debility." Of a total of 438 pregnancies reported, however, 397 or over 90% resulted in live births (Table 14).

[see p. 33-Analyt]

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Table 14

163 Relation of Live Births to Total Pregnancies as Reported by 84 Women in Bang Chan

	Number of mothers	Total cases	Percentage of total pregnancies
Pregnancies	84	438	100
Miscarriages	23	33	7.5
Deaths in utero	4	4	0.9
Stillbirths	3	4	0.9
Live births	84	397	90.6

Illness and Injury

759 Medical Services Available to Residents of Bang Chan. - Within the community of Bang Chan, about 8 traditional "doctors" and 15 traditional midwives practiced their skills. Three of the traditional practitioners were Buddhist priests. The others earned their living chiefly by farming. In addition, two or three persons who were skilled at massage, and at least one medium had some reputation for success in treating sick persons.

743 The nearest source of trained medical assistance was Minburi, the market town about 3 miles from Bang Chan. The staff of the Minburi Health Center, which was under Thai government auspices, included a first-class doctor, a dentist and a nurse-midwife. One or two beds were available for the use of critically ill patients until they could be taken to a hospital in Bangkok. For less critical illnesses, the second-class doctors who operated private clinics in Minburi seemed to get more patronage from residents of Bang Chan than did the doctor at the Health Center.

644 The majority of women in Bang Chan were delivered at home, by the traditional midwives. During 1952-53 we learned of two pregnant women who planned to go to the Minburi Health Center for delivery, but time did not permit them to carry out their plans. Some cases of prolonged or difficult labor were, [743] however, brought from Bang Chan to the Health Center, where a labor room and a delivery room were available in a separate wooden building. Facilities were very simple. Patients lay on

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mats on the floor as most of them would have done at home. Relatives were welcome; indeed they were supposed to come and help.

Nature and Incidence of Illness and Injury, and Treatments Sought by Residents of Bang Chan. - Evidence concerning the nature of illness and injury in Bang Chan was obtained in connection with the clinical examination of school children and persons in the random sample of village households; from questions in two types of structured interviews with household heads: 1) in the entire village, and 2) in one hamlet, KY-7; and from the field notes of workers associated with the Cornell Thailand Project.

In connection with the clinical examination, information was obtained from heads of 30 of the 31 households whose members were examined (See schedule in Appendix A).[1] In this group, none reported any accident or injury, and 26 said that no member had been ill within the year. Illness was reported as occurring in 4 households only. In one of these, a 49-year old man reported loss of sensation over the extremities and other symptoms which led the physician in the research group to conclude that he had beriberi. As treatment, this man had used an herb recommended by a priest, a native medicine given him by a neighbor and had gone to a private clinic at Minburi where he received an injection.[1] In another family, a 39-year old man who had asthma, took an advertised remedy which he purchased from a drugstore. Two children in the third family had fever for 8 days, for which a traditional practitioner prescribed herbs. In the fourth family, a 1-year old child with eczema was taken first to a traditional practitioner, then to a private clinic in Minburi where he was given an injection.

On the basis of other observations, however, we believe that illness and injury are more common in Bang Chan than is suggested by the replies to this particular inquiry. For example, no mention was made in one of the households surveyed of a baby who had been too ill to be weighed and measured, when team members called, and who recovered in a day or two without outside help. Coming as they did at the end of the clinical examination which was new to most of these people, perhaps the questions asked seemed relatively unimportant. No attempt was made to probe beyond the person's reply to the questions as stated.

Replies to questions in connection with an intensive

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1. From casual observation, one is led to believe that the villagers have considerable confidence in "injections," although the nature of the injection received or desired, is not usually specified.

A [see p.51 - Analyst]

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164 survey made in one hamlet, KY-7, give a rather different picture of the extent of illness and injury in Bang Chan, if the situation in this hamlet is at all representative of the whole. Hanks (1954), found that serious illness had occurred within the previous year in 17 of 38 households[1] in the hamlet KY-7. Twenty-four persons of various ages were involved, and the illnesses were described as lasting from a few days to 3 years. Specific diseases were mentioned in 7 cases: diphtheria, typhoid fever, pneumonia (2 cases), malaria and beriberi (2 cases). In the majority of instances, however, symptoms rather than diseases were mentioned, i.e. fever, diarrhea, pain in chest, disorder of throat, lung complaint, swollen feet, and the like. One case, described as a wound in a 5-year old child, might have been due to accident.

751 In all, the 24 ill persons obtained a total of 40 "treatments,"[2] from one to four types of treatment per patient. Treatment by modern doctors was used more frequently than other means of help (Table 15), although such treatment is not available within the community of Bang Chan. Fifteen of the 24 persons who were seriously ill had treatment by modern doctors, several patients receiving treatment from more than one. Thirteen patients had one type of treatment only (as that from either traditional practitioner or modern doctor), 7 used 2 types, 3 used 3 types, and 1 had 4 types of treatment from 5 individuals. The latter case was that of a child who was described as sick for 60 days with pneumonia, neck swelling and fever, and was treated by a traditional practitioner, two priests who were also traditional practitioners, and a medium, all in Bang Chan, and a second-class doctor in Minburi. Another child who was sick with lom sandan (faintness, weakness or loss of consciousness) for three days was treated by 4 local traditional practitioners and a second-class doctor at Minburi. One child with saang (a disease of young children, said to be caused by the loss of the soul or spirit) was treated by the modern doctor at Minburi, only.

757 As a rule, local practitioners of one sort or another
759 were visited or called first, those in Minburi next, and those in Bangkok, only after nearby help had been consulted. This order was not invariable however. For example, in the hamlet KY-7 series (Hanks, 1954) was one woman who was sick with beriberi for about 8 months after childbirth. She went first

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1. Interviews were not obtained with 3 of 41 household heads in the hamlet.

2. Each type of practitioner, as traditional practitioner or modern doctor, was counted as a separate "treatment."

[TEXT CONTINUED ON PAGE 37]

A [see p. 36 Analyst].

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Table 15

Treatment Used For Serious Illness by 24 Persons in 17 Households, Hamlet KY-7

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Specified Treatment	Locality			No. of Persons Treated
	Bang Chan or adjoining area	Minburi	Elsewhere[2]	
Persons consulted:[1]				
Modern doctor[3]		18(21)	4(7)	19
Traditional practitioner	11(14)		3	11
Priests	3 (4)		1	4
Muslim masseuse	1			1
Medium	1			1
Medicines used without advice of practitioner:				
Purchased from market			1	1
Obtained from neighbors	1			1
Home remedies	2			2
Total	19(23)	18(21)	9(12)	40

1. Figures indicate the number of persons who had the specified type of treatment, not the number of visits or treatments. The higher numbers in parenthesis indicate that in some cases a patient consulted more than one person in a category, i.e. more than one traditional practitioner or modern doctor.

2. Modern doctors in Bangkok and Tonburi, and at Don Muang; traditional practitioners at Chachoengsao, Bangkok and in the rural area near Bang Chan.

3. Doctors most often visited in Minburi were "second-class," i.e. not graduates of medical schools, but persons with a limited amount of training in modern medicine.

757 to a second-class doctor in Minburi, then to a nearby Muslim
759 masseuse, then to a local traditional practitioner who gave her some jaa tom (cooked medicine). Another instance, recorded in the field notes, is that of a school teacher's baby who had abscesses on her head. The mother took her child first to Minburi, where she was given an injection and a sulfa drug to be taken orally. The child did not get well immediately, and before all of the drug had been taken, the mother took the child to a local traditional practitioner who gave her a decoction of herbs which was to be given by mouth. Thus in some cases, modern doctors were consulted first, and local traditional practitioners later, if relief was not as speedy as was expected. The experience in this one hamlet suggested a willingness to try a variety of treatments, and the existence of a considerable degree of confidence in modern medicine.

758 According to Ralis (1955), 213 of 335 household repre-
743 sentatives interviewed had visited a clinic or hospital. Of these, 156 had gone to Minburi, and 135 to hospitals or clinics in Bangkok, some having gone to both places. Of 258 hospital or clinic visits, 125 were for treatment or hospitalization; the bulk of the rest were to accompany patients or to visit hospitalized relatives or friends. No significant difference in reports about seeking treatment or hospitalization was found between groups of persons differing in literacy, or in socio-economic level.

144 Infectious disease. - The principal evidences of infectious disease noted in the course of the clinical examination for assessment of nutritional status were trachoma and smallpox scars. Occasional cases of ringworm and other fungus infection, and of pediculosis were observed by the physician.

When the 233 school children and 148 additional persons included in the random sample of village households are considered together, i.e. a total of 381 persons or more than one-fifth of the total population of the village, only 3% were found to have trachoma. Eleven of 13 cases found were among 237 children 7 to 14 years of age, i.e. an incidence for this group of 4.6%. Zimmerman (1931) reported 119 cases or 4.3% of all persons examined in Central Thailand, and 277 cases or 2.9% of persons examined in the whole Kingdom. Among the school children examined, however, he reported an incidence of 12.6%.

Of 381 persons examined in Bang Chan, only 10, or fewer than 3% had smallpox scars. Two cases only were in adults, the remaining 8 being among children of school age. Our records do not show when the most recent cases occurred in the village.
751 According to Zimmerman (1931), 88% of over 2200 school children examined had been vaccinated. No information was obtained concerning the proportion of residents of Bang Chan who had been

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751 vaccinated but among school children the percentage is very high. During the survey period a health officer came to the Bang Chan elementary school to vaccinate children; and at that time at least one nearby resident, a school teacher's wife, brought her infant for vaccination.

164 Illnesses probably, in most cases certainly, of infectious origin, which were mentioned in the field notes, include the following, which are listed roughly in the order of frequency: skin disorders such as abscesses and boils, fever, respiratory disorders including colds and influenza, tuberculosis, "upset stomach," measles and diphtheria. Two cases of diphtheria with one death, occurred while the survey was in [744] progress. At this time health authorities came to the village to inoculate the children on a voluntary basis (Hanks et al. 1955). As already noted, malaria and typhoid (one case each), were mentioned as occurring during the year previous to the inquiry in Hamlet KY-7 (Hanks, 1954).

[759] [743] A number of references were made to history of cholera, smallpox and malaria, but these did not appear to be current threats. Two cases of severe diarrhea were called "cholera" but one was on the way to recovery the next day. The traditional practitioner who was asked to treat the other, urged that she be taken to the hospital, and himself accompanied the patient and family members. At the hospital, they were told that members of the family and neighbors should "get vaccinated and have their toilet covered."[1] No further mention of this case is made in the field notes, hence the correct diagnosis is not known to us.

Since a modern doctor was frequently not seen, diagnosis of disease was often uncertain. More often, major symptoms were described or the disorder was given a local name, for which there is no good English equivalent, such as various kinds of ssang and lom.

Non-contagious disorders. - Among current non-contagious disorders mentioned in the field notes, in replies to questions on surveys, and in some cases observed by the physician, were the following, listed roughly in order of frequency: menstrual disorders, headaches, beriberi, cancer, asthma, eczema, nephritis, and rheumatism.

Accidents. - Accidents which were recorded in field notes include bites of dogs, spiders, leeches and snakes, falls from buffaloes and down ladders, burns, cuts, drowning and poison from drinking kerosene. Among the school children examined,

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1. Field notes, S.S., April 29, 1954.

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164 malunion of old fractures was observed in two cases.

165 Deaths. - Information concerning deaths in Bang Chan
12 during the period of the field study was obtained primarily from field notes. Mothers interviewed or examined by members of the research group which was specifically concerned with health and diet provided further information on infant mortality, and Ralis (1955) obtained some information concerning deaths of children in the respondent's family.

165 Deaths occurring while the field study was in progress. - During approximately 21 months of field study, members of the research group noted 14 deaths in the village. Three infants died, two within a few days of birth, and one at about two months of age. Two children died by accident, one as the result of a fall from a water buffalo, and the other by drowning. One child died of diphtheria and one of Hodgkin's disease. Of the seven adults who died during this period, one was a pregnant woman who became acutely ill and died while enroute to the Health Center at Minburi by boat. The cause of her illness was not known. One young man committed suicide, two adults died of tuberculosis, two of cancer, and one of colitis. One of those who died of tuberculosis was a young woman, the mother of seven children. She was urged by the physician on the team to go to the hospital in Bangkok, but she was unwilling. A sibling 8 years old, who lived in the same household, had died previously with a severe cough.

Mortality among infants and children. - Of the 397 living children born to 84 women interviewed, 323 or 81% of the children survived at the time of interview. Forty-three, or 11% had died within the first year, and 26 or 7% within the first month of life.

Although the data obtained by Ralis (1955) did not permit us to calculate the exact number of children born to the 335 household members interviewed, the number dead, and the number surviving at the time of interview, apparently more than twenty per cent of the children born into these families died (Appendix A). A This estimate, for the village as a whole, tends to substantiate the figures obtained from the 84 mothers whom we interviewed.

Some information was obtained from 36 mothers concerning the cause of death of 58 children who were born alive. Twenty-one of these had lost one child only, 8 had lost 2 each, and 7 had lost 3 children each. Reported causes of death are summarized by ages, in Table 16. A

In most cases, no specific cause could be assigned, and the case was classified according to the most prominent symptom as fever, convulsions or digestive disturbance.

A [see p.51-Analyst] B [see p.40-Analyst]

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Table 16

Reported Causes of Death of 58 Infants and Children in Bang Chan. (Information obtained from parents.)

	Number of children dying at each age			
	Under 1 month	1 month to 1 year	1-5 years	5-10 years
Cause of death:				
Tetanus	8			
Probably tetanus	4			
Infantile beriberi		2		
Convulsions, cause unknown	1	4	2	
Fever	6	7	4	
Debility	4	2		
Digestive disturbance		2	2	
Sepsis	1		1	
Drowning				3
Diphtheria			1	
Other	2			2*
Total	26	17	10	6

*one with severe cough (tuberculosis ?)

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Deaths of infants a few days old, with a description of lockjaw, inability to suck, stiff back and clenched hands, were recognized as due to tetanus. The common practice of native midwives is to place the cord over a hard rhizome or clod of earth and to cut it with a tapered piece of bamboo. Thus, infection with the tetanus organism may occur from contact with the soil. Note that 12 of 26 deaths reported for infants under 1 month, were diagnosed as tetanus or probably tetanus. Zimmerman (1931) summarized important causes of death in Siam, based on the physician's diagnosis made after symptoms were described by the head of the household. Of 1800 deaths which occurred in the 18 months preceding the survey, 2% were diagnosed as tetanus. For the Central area, 3.8% of 495 deaths were from tetanus. Most, if not all of the cases of infantile tetanus could be prevented if native midwives learned to avoid contact of the cord with earth or a soil-coated rhizome. By using sterile scissors for cutting the cord instead of tapered bamboo which must be pressed against another surface to accomplish the cutting, contact with soil could be avoided. Of 335 household heads interviewed, 220 owned scissors of some kind (Ralis, 1955).

Infants several months old, who had some of the symptoms of infantile beriberi, as convulsions and almost voiceless crying, were considered as cases of infantile beriberi only if the mother had symptoms of beriberi, such as numbness or tingling in the extremities, or difficulty in walking, at the time. One mother had lost 3 infants at 3 or 4 months of age, with similar symptoms, but described the symptoms of beriberi in herself at the time of the death of the last baby only. The other two cases were therefore listed as convulsions, cause unknown. The occurrence of infantile beriberi reflects the unsatisfactory nutriture of the mother, whose milk is therefore low in thiamine content. To prevent deaths from infantile beriberi, the general level of nutrition in the village, and particularly the food habits of pregnant and nursing women, should be improved.

Note also the number of deaths from "debility." As the Joint FAO/WHO Expert Committee on Nutrition (1951) has pointed out, the number of early deaths from "congenital debility" becomes insignificant where the health and nutritional status of pregnant women approaches the optimal.

Intestinal Parasitism and Bowel Habits

Intestinal Parasitism. - All school children were provided with tin containers labelled with their names, and asked to bring a stool sample to school. Fourth grade children whose first stool samples were negative, were asked to bring a second specimen. Parasites were found in some of these second

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125 specimens. In all, specimens were obtained from 189 or 81% of
126 the children and of those 32% were negative. In 128 stools
164 containing parasites, 196 infecting organisms were found, or an average of 1.5 per infected child. Protozoa and helminths which are pathogenic or which may cause severe diarrhea were identified 126 times, and harmless forms 70 times. Of the harmful forms, Ascaris lumbricoides was found in 96 or 51% of the stool samples, Giardia lamblia in 19, or 10%, and hookworm, Endamoeba histolytica, Trichuris trichiura and Diphyllobothrium in 2% or less. Of the harmless forms noted, Endamoeba coli was found in 45 specimens or 24%, Iodamoeba williamsi in 21 or 11%, Endolimax nana and Chilomastix mesnili each in less than 2%. Doubtless the extent of intestinal parasitism in these school children was greater than the figures indicate, since some cases would be missed in examination of single stool specimens collected in this way. One might expect intestinal parasitism to be relatively common, also, among other family members.

125 Bowel Habits. - In connection with the clinical survey,
147 persons examined were asked whether they had "constipation" or
514 "diarrhea" frequently, occasionally, or never, i.e. not within the past 6 months. As the physician phrased the questions concerning "constipation," the replies indicated whether the respondent had daily bowel movements ("never constipated"), or usually had a bowel movement each day ("occasionally constipated") or usually had longer intervals between bowel movements ("frequently constipated"). Replies are summarized in Table 17.A

126 Considering the inadequate sanitation in Bang Chan, and
147 the prevalence of intestional parasitism, the fact that 3/4 of the persons questioned said they "never" had diarrhea, is worthy of note. Most persons who reported having diarrhea,
[146] were troubled occasionally rather than frequently. The fact that nearly 2/5 of those questioned had bowel movements less often than once a day, is not surprising in view of the fact that diets which are relatively low in fibrous foods and in the B complex vitamins frequently result in sluggish behavior of the large intestine. That approximately 3/5 of the respondents in Bang Chan usually had a daily bowel movement is perhaps more noteworthy. Even in areas where diets tend to be much more liberal, some persons usually have bowel movements at intervals of 2 or 3 days or even longer. If such persons have stools of normal character and experience no discomfort, this bowel habit may be considered normal for them.

A [see p. 43 - Analyst]

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W6
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Table 17

Bowel Habits of Persons Questioned in Bang Chan, Thailand, 1952-53

Group	Number of Persons Reporting	Frequency of Bowel Movements			Frequency[1] of Diarrhea		
		Daily	Usually 1/day	Usually longer intervals	F	O	N
		%	%	%	%	%	%
Random Sample of village Households	158	57	11	32	2	19	79
Primary school children	233	53	3	44	2	26	72
Total respondents	375[2]	54	7	39	2	23	75

1. F - Frequent; once a week or oftener.
O - occasional; less often than once a week.
N - never; not within the past 6 months

2. Primary school children in random sample counted once only. Information not obtained in a few instances.

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44

Sanitation

364 Disposal of Garbage. - Of the 6 categories for disposal of garbage listed on the schedule (Appendix A), 3 only were used by the families who took part in the dietary study (Table 18).

Table 18

Disposal of Garbage in 11 Households, Bang Chan

Round[1] of dietary study	Number of Families Using Each Method			
	I	II	III	IV
[231] Garbage fed to animals	10	10	10	10
Garbage thrown into canal	2	6	3	4
Garbage thrown elsewhere	5	5	5	5

1. Each family was visited 4 times during the year. Each series of visits to the 11 households was called a round.

Ten of the 11 families fed some garbage to animals, and for 4 families, on 10 survey days, (i.e. 1 to 4 days per family), this was the only manner of garbage disposal. One family had no animals other than chickens, and these were not fed garbage on the survey days.

Each family seemed to have its own pattern for disposal of garbage which was not fed to stock. Those who threw it in the canal, did so consistently, except when the nearby canal was dry, and those who threw garbage elsewhere, did this consistently. No one was observed to burn or bury garbage.

251 Protection of Food From Contamination by Insects and Other Animals. - Large oil tins, with covers, were commonly used to store dry rice and other non-perishable foods in the kitchen area. One family covered the container with a plate.

In 8 of the 11 households of the dietary study some provision was made for storage of left-over and perishable foods. None of the households had screened cupboards, but two used some means to ant-proof the legs of the cupboard such as rubbing them with powdered pitch, or setting them in bowls of water.

A2 [see p. 63-Analyst]

251 One family stored cooked food in a basket which was hung from the ceiling. One homemaker frequently covered such foods with a basket, and in one instance a homemaker, who usually took no precautions to protect cooked foods, used a basin to cover food left on a table.

271 312 Source and Treatment of Water For Drinking and Culinary Purposes. - From the time the dietary survey was begun, on May 26, 1953, through January 18, 1954, all families used rain water for drinking.

Of the 14 survey days, spaced at about weekly intervals, between January 28, 1954 through May 8, 1954, canal water was used for drinking on 7 days, water from fish ponds on 4, and rain water on 3 days. No distinction was made in source of drinking water for children and adults.

312 744 [846] All families used canal water for washing vegetables, cooking, and washing dishes, on the survey days from May 26, 1953 through March 18, 1954. On the 6 survey days between March 24 and May 8, 1954, 4 families used water from the fish pond for these purposes. In no instance was the water treated in any way before being used, although alum is known to be used, at times, in the village, to settle or clear water, and boiled water is given mothers and infants to drink during the post partum rest period.

514 Disposal of Excreta. - Of 30 families from whom information was obtained, 20 had pits for toilet use, only one of which was equipped with a cover. One other family had a flush latrine. Of the 8 families who had no special place which was used for toilet purposes, 4 reported that family members urinated on the compound, 3 that they used the fields, and 1 that either compound or field might be used for urination. One reported that the compound was used for defecation as well as urination; the remaining 7 said they went to the field to defecate.

Six families with pit latrines covered feces in some way: 3 used earth, 2 ashes, and 1 either earth or ash. A majority of those who used either an uncovered pit or had no designated place, reported that no attempt was made to cover feces. From six families, no information was obtained on this point. Various materials were mentioned as being used in the manner in which western peoples use toilet paper. Cocoanut husks were mentioned most frequently (25 times), and other materials in this order: paper (newspaper 9 times, straw paper once), wood (4 times) and water (3 times).

From the information available, custom and convenience rather than sanitary considerations appear to determine practices that are followed. If improved practices are

514 contemplated, use of a pit with cover seems more apt to be adopted than the flush latrine. Moreover, the flush latrine is not only more expensive and difficult to move, but cocoanut husks and the like cannot be thrown into it without clogging the trap. If the husks, paper, etc. are left exposed after use, they attract flies and other insects, and are a possible source of infection.

Choice of a suitable site for a pit latrine in a village such as Bang Chan, which is flooded at times, may be difficult. Certainly it requires the advice of a sanitary engineer.

000 Changes in Sanitary Practices Needed. - A few changes in sanitary practices, if they could be brought about, might reduce some kinds of illness substantially. For example, if the villagers would adopt the practice of boiling pond or canal water whenever it is to be used for drinking, contamination from this source would be materially reduced.

Use of boiled water for bathing babies and all persons with abrasions or open wounds would probably reduce the incidence of skin infections, and enable those which do occur to heal more quickly.

Infantile tetanus could be largely if not entirely prevented if the local midwives were taught to use sterile scissors for cutting the cord, and to avoid contact of the cord with soil.

Modern medicine will probably not be readily or generally available to a majority of the residents of Bang Chan for many years to come. The first step toward better health in a village such as Bang Chan appears to be to teach the people, through their local leaders and practitioners, to adopt improved health practices. To be effective, such teaching must be based not only on a knowledge of what the people do, but on an understanding of the way they think and feel about customary practices.

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[P. 50 is blank]

Appendix A

Schedule for the Clinical Examination

125

Cornell University Thailand Project 1952-53. Schedule 3.

Date .....

1. Hamlet ..... House No.....
2. Name 1).....
   2).....
3. Sex M F
4. Birth date .....
   Age yr..... Mo.....
5. Single ..... Married....yr.
6. Weight ..... kg.
7. Height ..... cm.
8. Bicristal diam. ..... cm.
9. Cristal Ht. ..... cm.
10. General appearance and vitality:
    poor....fair....good.....
11. Hemoglobin:
12. Stool examination:
13. Hair:
    a. Dry and staring .....
    b. Diminution or loss of pigment .....
14. Eyes:
    a. Photophobia .....
    b. Lachrymation .....
    c. Blepharitis .....
    d. Xerophthalmia .....
    e. Excess conjunctival tissue .....
    f. Bitot's spots .....
    g. Corneal vascularization (gross) .....
15. Face:
    a. Folliculosis .....
    b. Nasolabial seborrhea ....
    c. Dyssebacia .....
    d. Suborbital pigmentation .....
16. Lips:
    a. Cheilosis .....
    b. Scars of cheilosis .....
    c. Angular stomatitis .....
    d. Scars of angular stomatitis .....
17. Tongue:
    a. Papillae atrophied .....
    b. Papillae hypertrophied .....
    c. Edema .....
    d. Color change-scarlet ....
    e. Color change-magenta ....
    f. Appearance-fissured .....
    g. Appearance-geographical .....
    h. Not ascertained - Betel .....
18. Gums:
    a. Swelling .....
    b. Redness .....
    c. Recession .....
    d. Retraction .....
    e. Loss of interdental papillae .....
19. Parotid glands enlarged ....
20. Thyroid:
    a. Enlarged .....
    b. Scars .....
21. Betel: Yes..... No.....

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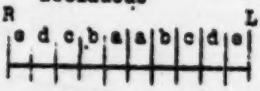
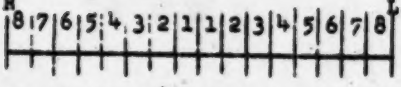
125 **Schedule for the Clinical Examination (continued)**

22. Teeth

deciduous



permanent



O - missing ± - just erupting
X - carious ∮ - filled

23. Skin:
- a. Symmetrical dermatosis .....
- b. Phrynoderma .....
- c. Perifollicular congestion .....
- d. Petechiae .....
- e. Xerosis .....
- f. Loss of elasticity .....
- g. Atrophic .....
- h. Ulcers .....

24. Edema: .....

25. Knee jerk absent .....

26. Ankle jerk absent .....

27. Calf tenderness .....

28. Inability to rise from squatting .....

29. Liver enlarged .....

30. Spleen enlarged .....

31. Posture-Winged scapulae .....

32. Skeleton:
- a. Frontal bosses .....
- b. Beaded ribs .....
- c. Wrists enlarged .....
- d. Bowed legs .....

33. Diarrhoa:
- a. Frequent .....
- b. Occasional .....
- c. Never .....

34. Constipation:
- a. Frequent .....
- b. Occasional .....
- c. Never .....

35. Menstruation:
- a. Regularity: Yes.... No.....
- b. Duration, ...da
- c. Interval .....
- d. Menarche, ...yr
- e. Menopause .....yr

36. Children:
- a. Total children born .....
- b. Number of children alive now .....
- c. Stillbirths .....
- d. Deaths in utero ...
- e. Miscarriages .....
- f. Other deaths .....
- g. Age of the oldest child .....yrs.
- h. Age of the youngest child .....yrs.

Comments .....

.....

.....

.....

.....
Examiner

Procedures Used in Obtaining Information Recorded on Schedule for Clinical Examination, and Descriptions of Possible Signs of Nutritive Failure

For the clinical portion of the nutrition survey, the team consisted of a Thai physician, who carried out the clinical examination, the nutritionist, who made the physical measurements, a second-class chemist, who did the hemoglobin determinations and served as interpretor, and a local boy who not only propelled the boat but helped in other ways such as giving directions to the children concerning preparations for being weighed and measured. The nutritionist was the only non-Thai on the team. The physician's internship had been served in a hospital in which he had opportunity to see many patients with nutritional disorders.

The material which follows is primarily descriptive of the procedures agreed upon in advance of the clinical examination. When different descriptions of a given sign were obtained from the various sources, the criteria which the physician agreed to use, after discussion with the nutritionist, are stated here. Some of the signs described were not observed in any of the persons examined in Bang Chan.

Before beginning the survey, the examining physician and the nutritionist agreed that only signs which could be considered undoubtedly positive should be so recorded.

In preparing the schedule, care was taken to avoid diagnosis, i.e. the physician was to record what he saw. If the examining physician believed diagnosis or probable diagnosis would be helpful, he recorded this under Comments. Thus Comments included such items as the following:

1. Diagnosis of deficiency disease, together with nature of onset, association with other conditions such as pregnancy, malaria or dysentery.

2. Obvious present disease as trachoma, ring worm etc. or evidence of past disease, as smallpox scars.

3. Complaints such as bloody stools, or other conditions which might affect adversely the general health and nutrition.

The schedule was designed to be used with all ages and both sexes. Items relating to menstrual and child bearing history were placed at the end, to be used for adolescent girls and women.

Comments on the items on the schedule follow:

1. Hamlet and house number. Information given by the school child or householder was checked later with the census data.

125 128 2. Name. The name was recorded according to the Mary Haas system of transliteration, modified for use on a typewriter. Later a code number was given each individual examined.

3. Sex. The appropriate symbol, M or F, was circled.

4. Birth date, when known, was recorded in Thai, according to the Thai calendar. This information was later translated into age in years and months. Information given by school children was checked against that in the school records, which were obtained by the school teachers from the Naai Amphoeoe, or district officer. At present, parents are required by law to register the birth of a child within 15 days. In practice, however, the interval between birth and registration is frequently longer, and the recorded date may be somewhat later than the actual birthdate. In preparing height-weight-age tables, age to nearest birthday was used. In a few cases, the birth date as given by a school child and that in the school records differed enough so that age to nearest birthday was in doubt. Data for such children were omitted in preparing the tables.

5. Marital status was recorded either as single, or the number of years married. To avoid embarrassment if there had been no legal marriage, the question was phrased so as to mean "How long have you had a house?"

6. Weight. A bathroom scale with 1/2 kg. divisions, with a magnifying glass over the scale reading so that one might interpolate to 1/4 kg., was used. All persons were asked to stand with the feet squarely on the platform, with the toes not extending beyond it. In order to get weights under as nearly standard conditions as possible, school children and adults were instructed to remove all but a minimum of clothing. All boys, [29] and the younger school girls removed their blouses, belts, and any items in pockets, leaving only short trousers, for the boys, and for the girls, a Thai-style skirt (phaasin) or standard western style school costume consisting of cotton skirt with attached bib and shoulder straps. Older girls were asked to re- [29] move the outer blouse and belt but were allowed to keep on the under blouse or camisole, as well as skirt. The children did not wear shoes to school.

[29] In the homes, preschool children were usually weighed nude, older girls and women in inner blouse, and phaasin or phaanung, and the men in trousers only.

Several examples of each type of clothing were weighed. Clothing worn by children whose body weight was 22.5 kg. or less, usually weighed considerably less than 1/4 kg., and would therefore make no detectable difference in the observed weight. Clothing worn by the larger school children and adults weighed, on the average, about 1/4 kg.

School children were asked to empty the bladder before being weighed. To minimize the effect of food, school children were weighed between 10 A.M. and noon. We were unable to carry out these precautions in connection with the survey of persons in a random sample of village households.

7. Height. A locally made wooden measuring device, hinged so as to fold (4 sections, each 50 cm. long) and provided with a sliding set square, was used for measuring height. The individual was told to stand with heels and shoulders against the measuring device, with chin parallel to the floor. Persons old enough to cooperate were asked to take a deep breath and "stand tall." The set-square was brought into contact with the person's head and the height, to the nearest 1 cm., noted. Smaller school children sometimes had to be helped to assume the desired position. An infant was measured by putting the device on the floor, and placing the baby on it. The knees were then pressed down, so that the backs of knees were in contact with the scale. One team member then placed a flat-surfaced object such as a book, perpendicular to the scale, against the soles of the feet, while another brought the set-square into contact with the infant's head.

8. Bicristal diameter was measured with a polvimeter. The subject stood, with heels together, before the examiner, who felt for the highest points of the iliac crests, and placed the polvimeter, with firm pressure. The polvimeter was calibrated in centimeters, but readings were estimated to the nearest 0.5 cm.

9. Cristal height. The height of the iliac crest was taken as the vertical distance of the left iliac spine from the floor. The subject was asked to stand with left side toward the measuring device used for height, and the distance of the set square from it. The examiner felt for the iliac crests, placing her right hand so that the thumb was at the level of the tip of the iliac crest. She tried to see that the subject's pelvis was held level and not tipped. An assistant then lowered the set square to the examiner's thumb, and the height was measured by reading the level of the set square.

10. General appearance and vitality. This item represented the examining physician's impression of the behavior of the subjects. Facial expression, attitude, degree of alertness, and behavior while waiting for the examinations were taken into account. Thus a child with good vitality would appear alert and interested, whereas a child who was rated poor might be apathetic, abnormally subdued or lacking in initiative.

11. Hemoglobin was determined by means of a Spencer Hb-Meter (American Optical Co., Scientific Instrument Division, Buffalo 15, N.Y.). Values were recorded in grams per 100 ml. of blood. Very little resistance was encountered to the finger

puncture, although a few adults and two school age children refused. No attempt was made to determine hemoglobin for most children under school age.

12. Stool examination. Each school child was furnished with an appropriate container labelled with his name. Pupils were asked to bring the container, with stool sample, to the teacher. Specimens were examined at the Pathology Department of Chulalongkorn Hospital.

13. Hair.

a. Dry and staring. Hair which has lost its normal sleekness and luster, and is dry and brittle.

b. Diminution or loss of pigment. In dark haired people, an auburn tinge is evident in mild cases. (Note: None of the cases seen in Bang Chan had progressed beyond this to "ginger" or tow-colored hair).

14. Eyes.

a. Photophobia, when present, was always recorded. If obviously due to some non-nutritional eye disease, this fact was recorded under comments.

b. Lachrymation, which is often associated with photophobia, was recorded when elicited by brief eye examination.

c. Blepharitis. Inflammation of the muco-cutaneous junction of the eyelid, with or without scaling and crusting or loss of eyelashes. If blepharitis was obviously associated with some non-nutritional eye disease, such as trachoma, this fact was recorded under comments.

d. Xerophthalmia. The conjunctiva is abnormally dry and appears thickened, yellowish and opaque.

e. Excess conjunctival tissue. Thickening of the bulbar conjunctiva, which appears opaque and yellowish. The tissue is moist. When the subject moves the eye from side to side, a thickened conjunctiva is thrown into a moving ripple of folds.

f. Bitot's spots. An extreme form of thickening of the epithelium of the bulbar conjunctiva. The spots resemble patches of chalk paste which have been striated with a pin.

g. Corneal vascularization (gross). Loops of newly-formed capillaries appear near the corneal margin, and extend onto the cornea. Since a slit lamp, which is necessary for observation of early stages, was not used, gross changes only could be noted.

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15. Face.

a. Folliculosis. Pouting of the sebaceous and pilosebaceous follicles of the face.

b. Nasolabial seborrhoea. A scaly or greasy desquamation; flaky accumulations of seborrhoeic material in the nasolabial folds.

c. Dyssebacia. A condition probably representing a severer degree of folliculosis. The pouting sebaceous follicles contain plugs of greasy material. The condition is usually most marked in the nasolabial folds, but in severe cases extends to the nose, cheeks, chin and the whole butterfly area.

d. Suborbital pigmentation. A brownish or greyish-brown area of pigmentation under the eyes, often seen in severe starvation.

16. Lips.

a. Cheilosis. The earliest change in cheilosis is a loss of the normal uniformly shiny appearance of the vermilion of the lips. A somewhat "velvet-like" appearance is associated with a milky "bloom". In more severe cases the lips are reddened, capillaries are engorged and the mucosa at first appears thin and shiny; later, scaling, ulceration and cracking may occur, with crusts of blood and serous exudate.

b. Scars of past cheilosis: Multiple antero-posterior linear scars of the lips; the vermilion of the lips takes on a slightly tissue-paper like appearance.

c. Angular stomatitis. A lesion which varies in severity, ranging from slight scaliness with small cracks in the epithelium at the corners of the mouth to a pale, moist and ulcerated appearance with fissures extending onto the neighbouring skin of the face.

d. Scars of angular stomatitis. Scars in the corners of the mouth.

17. Tongue.

a. Papillae atrophied. The tongue is dry, smooth and glazed, with atrophy of the papillae.

b. Papillae hypertrophied.

c. Edema. Swelling which is evidenced by indentations of the teeth along the margin of the tongue.

125 128 d. Color change - scarlet. A bright red color of the tongue, like that of raw beef.

e. Color change - magenta. The normal pink color of the tongue is changed in the direction of blue or purple.

f. Appearance - fissured. The presence of deep central or lateral fissures which may run antero-posteriorly or transversally.

g. Appearance - geographical. Superficial erosion of the tongue, appearing in irregular patches. These are redder than the unaffected area.

h. Not ascertained - Betel. This category was added to designate cases in which the tongue was so coated from betel chewing that color changes and changes in papillae could not be noted.

18. Gums.

a. Swelling. Swelling of the interdental papillae with an increased tendency to bleeding when the papillae are pressed. Later, the whole gum may be swollen and purplish.

b. Redness (gingivitis). The gums are red and hyperemic, particularly at the margins.

c. Recession of the gums.

d. Retraction. The margins of the gums become detached from the tooth.

e. Loss of interdental papillae. The papillae no longer fill the interdental spaces neatly.

19. Parotid glands enlarged. Mild degrees of enlargement may be detected more readily by observation from above or behind than from in front. Both Smith (1952) and Nicholls (1951)[1] mentioned the association of parotid enlargement with malnutrition in the tropics.

20. Thyroid enlarged. Obvious enlargement was recorded. An item was included for scars of thyroidectomy, if any should be seen.

21. Betel. If the subject chewed betel frequently or habitually, so that the teeth were stained, this item was checked "yes". In the "no" category, may be some persons who have tried

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1. Nicholls, 1951, p. 394.

betel chewing, but have not persisted in it.

22. Teeth. Changes in the teeth were noted by means of a series of symbols on two dental diagrams, one for deciduous and one for permanent teeth. Teeth just erupting, missing, carious or filled were noted. A dentist examined the teeth of the school children, in good natural light, using mouth mirror and probe. Inspection of persons in the random sample of families was carried out by the physician without mirror or probe, therefore the record is of gross changes only. If a tooth was crowned, the physician inquired whether the tooth had been sound or carious before being crowned.

23. Skin.

a. Symmetrical dermatosis. Any skin disorder which had a symmetrical distribution was noted, and the physician's diagnosis recorded under Comments. Pellagroid dermatosis begins as an erythema resembling sunburn and develops into a symmetrical, rough hyper-pigmented dermatosis with sharply defined margins, usually on areas exposed to sunlight. Areas may desquamate with serous exudate in the centre.

b. Phrynoderma. A type of follicular hyperkeratosis which occurs on the back of the arms, on the thighs, abdomen, shoulders and buttocks. Viewed through a lens, the enlarged glands are seen to be plugged. The eruption can be felt by passing the tips of the fingers over it.

c. Perifollicular congestion. Congestion occurs around the hair follicles, frequently limited to the legs and forearms.

d. Petechiae. Pinpoint hemorrhages, which are most apt to occur around hair follicles.

e. Xerosis. Dryness of the skin, diminution or absence of sebaceous secretions, sometimes also of sweat. (Note: Crackled skin was originally included as a separate sign. No clearly defined cases were noted, however, and since the physician was uncertain of the distinction between early stages of crackled skin, and xerosis, the latter term was used to cover all such lesions.)

f. Loss of elasticity. Diminution of suppleness of skin seen as a fine wrinkling, particularly over the calves. When the superficial skin is pinched up and released it returns very slowly to its smooth condition.

g. Atrophic skin. Thinning of the skin, generally most marked on legs below the knee. The skin usually appears smooth, tightly stretched and shiny.

Note: The skin changes known as xerosis, loss of elasticity and atrophic skin, which are associated with defective nutrition, mimic closely the changes in senility.

125 h. Ulcers. Single or multiple ulcers, other than
128 those associated with varicose veins, confined to the skin of the legs below the knees.

24. Edema, if present, was noted.

25. Knee jerk. Absence of the knee jerk was recorded.

26. Ankle jerk. Absence of the ankle jerk was recorded.

27. Calf tenderness. The patient's reaction was noted when the calf muscles were squeezed firmly.

28. Inability to rise from squatting. The patient is made to squat with his thighs fully flexed on his legs, and is asked to rise. When this is done with difficulty, the hands grasping the knees and aiding the legs to bring the body into an erect position, the test is positive.

(Note: This test was not applied to persons who were obviously active and had good muscular coordination. Thai customarily sit or squat on the floor, and would be peculiarly aware of such difficulty.)

29. Liver enlarged.

30. Spleen enlarged.

For this part of the examination (items 29 and 30), the subject was asked to lie on his back with his knees flexed, to relax the abdomen and take a deep breath. The physician palpated the costal margins in the usual manner. If liver or spleen were found to be enlarged, the appropriate space was checked, and the description of size and texture of the organ entered under Comments.

31. Posture:

Winged scapulae. The fingers can be placed easily under the inner border or tip of the scapula.

32. Skeleton.

a. Frontal bosses. Protruding forehead, giving the person a "box-headed" appearance.

b. Beaded ribs. A line of enlargement at the costochondral junction of the ribs.

c. Enlargement of epiphyses at wrists.

d. Bowed legs. The subject was asked to stand with feet parallel and together, the body erect. If the space between his knees was more than 1 finger breadth (1.5 cm.) or the legs below the knees curved outward obviously, the person was considered to be bow legged.

125
128 e. Knock Knees. The subject was considered to be knock kneed if the knee joints overlapped markedly.

33. Diarrhea. As phrased, the question meant literally "Do your bowels run or not?" If the answer was affirmative, the physician asked further questions to determine about how often this occurred. "Frequent" diarrhea meant that watery stools were passed every week, i.e. that stools seldom were formed. "Occasional" diarrhea meant the passing of watery stools once in a long time, and "Never" meant that diarrhea had not occurred within the past 6 months.

34. Constipation. The question as asked by the physician meant literally "Do you have a stool every day?" The physician checked "frequent" if the subject did not usually have a bowel movement each day; "occasional," if the subject usually had a daily bowel movement, but once in a while a day was skipped. "Never" meant that the subject had a bowel movement daily during the previous 6 months.

Note that this question does not relate to constipation, in the true sense, since it tells nothing of the character of the stool or feelings of the subject, but is confined to the interval between stools.

35. Menstruation.

a. Regularity. This was indicated by a check mark after yes or no.

b. Duration. The question "How many days does it last?" The number of days, as stated by the informant, was recorded.

c. Interval. The replies were grouped into 3 categories: 1) usual interval, i.e. about 1 lunar month; 2) markedly less than 1 month; or 3) markedly longer than 1 month.

d. Menarche. The age in years, at first menstruation, was recorded. Young girls, who appeared adolescent, were asked by the physician if they had menstruated yet. To be sure the question was understood and properly answered, a woman school teacher questioned these girls separately.

e. Menopause. Age, in years, of last menstruation, was recorded for women who had passed the menopause.

36. Children. Appropriate numbers were recorded in each category.

a. Total children born . . . . . .

125 b. Number of children alive now . . . . . .

128 c. Stillbirths . . . . . .

d. Deaths in utero . . . . . .

e. Miscarriages . . . . . .

f. Other deaths . . . . . ., i.e. deaths of children born alive. Notes were made on the age and circumstances of death. When the description was clear, the physician noted the cause of death.

g. Age of the oldest child . . . . . in years.

h. Age of the youngest child . . . . . in years.

The investigator noted whether or not related items such as years of marriage, age of oldest child, age of youngest child, age at menarche, and age at menopause, were reasonably consistent. A few replies were discarded as unreliable.

Schedules Used in Recording Information on Sanitation

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Cornell University Thailand Project, 1952-53,
Schedule 8, Sheets 1 and 2.

F. At this season what kind of water is used for each of the following purposes, and what treatment, if any, is given to it?*

USE	SOURCE			TREATMENT			
	Rain	Khlong (canal)	Fish-pond	None	Alum	Boil-ing	Other (what)
1. Drinking, adults							
2. Drinking, children							
3. Washing vegetables							
4. Cooking							
5. Washing dishes							

G. How is garbage disposed of? (check)

1. Buried ..... 4. Thrown elsewhere .....
2. Burned ..... 5. Fed to animals .....
3. Thrown into khlong (canal) ..... 6. Other .....

H. Does the householder attempt to protect food against contamination by insects, animals etc.? Note means used.

Means used	Type of Food	
	1) Dry rice -- other nonperishable foods	2) Perishable foods and left-over cooked foods
1. Container covered:		
a) Solid cover		
b) Paachii (fiber)		
2. Food safe:		
a) Screened		
b) Ant-proof legs		
3. Other		
4. None		

* Indicate whether answer is obtained by query (q) or observation (obs.)

125 Cornell University Thailand Project, 1952-53, Schedule 6.

3. Toilet facilities:

a) Flush latrine ..... b) Pit ..... c) With cover .....

d) None - Use:

	Compound	Fields	Khlong (canal)	Other
For urination				
For defecation				

e) Treatment of feces (for items b. & d. only)

1) None ..... 2) Covered with earth ..... 3) Other ...

f) "Toilet paper": 1) Newspaper ..... 2) Straw paper .....

3) Cocoanut husks .....

4) Other .....

125 Schedules Used in Recording Information on Illness or Injury

Cornell University Thailand Project, 1952-53, Schedule 6.

1. Has any member of the family been ill or injured during the past year? Yes ..... No .....

2. If yes, give details below:

a) Family member	b) Nature of illness or injury:	c) What was done?*

* Include persons asked for help; drugs used, with information from labels if available; and techniques.

Household Questionnaire, KY-7, March-April 1954 (Hanks)

Question: Was there serious sickness in your family during the past year?

If R says that serious illness occurred in his family:

What was the name of person who was ill?

What was the name of the illness?

Names of persons who were called to treat the patient, listed in the order in which they were called.

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Cornell Methodology Project: Thailand
Bang Chan Structured Questionnaire

28. a. Your own children, all of them that have ever been born, how many are there?

b. How many of your children are still living?

c. How many of your children have died?

Responses to this question follow:

Children of 331 Household Heads, Bang Chan

Item No.	(28a.) Number born	(28b.) Number still living	(28c.) Number dead
None	24	29	198
1	32	40	44
2 or 3	69	83	56
4 or 5	73	82	17
6 or more	133	97	9
Number of respondents	331	331	324

33. a. Have you ever been to a clinic or a hospital?

b. If YES: In what various places?

c. If R HAS BEEN TO CLINIC OR HOSPITAL: For what various purposes did you go?

Appendix B

Table 19

191 Summary of Heights and Weights[1] of 34 Pre-school Children in
145 the Random Sample of Village Households, Bang Chan, 1952-53

Age	No. of Persons	Height		Weight		
		Mean	Range	Mean	Median	Range
		cm.	cm.	kg.	kg.	kg.
Males						
Mo.						
Under 1	2	50.8	50.0-51.5	3.4	3.4	2.95-3.8
5-6	1	61.0		5.5	5.5	
11-12	1	69.0		8.3	8.3	
Years						
1-1½	4	68.5	65.0-70.0	8.3	8.1	7.0 -10.0
2	1	89.0		13.0	13.0	
3-3½	3	86.7	83.5-90.0	11.2	10.5	10.0 -13.0
4-4½	4	96.5	90.5-104.5	14.2	14.0	12.75-16.25
4½-5	1	98.5		12.5	12.5	
6	2	105.0	101.5-108.5	17.0	17.0	16.5 -17.5
Females						
Mo.						
1	1	63.0		5.2	5.2	
3	1	54.0		5.5	5.5	
7	1	63.0		5.5	5.5	
9	1	60.5		6.3	6.3	
11-12	1	70.0		7.5	7.5	
Years						
1½-2	2	73.3	71.0-75.5	9.3	9.3	9.3 - 9.3
2½-3	2	81.5	81.0-82.0	10.5	10.5	10.0 -11.0
3½-4	3	85.5	85.0-86.0	11.7	12.0	10.5 -12.5
4½-5	1	94.5		12.5	12.5	
6	1	108.0		18.5	18.5	
7	1	107.5		17.5	17.5	

1. Preschool children were weighed nude.

Table 20

145 Estimated Median Ages of Eruption of Specific Permanent Teeth in Children of Bang Chan[1]

Tooth	Jaw	Side	Boys		Girls	
			Age of Eruption		Age of Eruption	
			Each Side	Average	Each Side	Average
			Years	Years	Years	Years
1. Central Incisor	Upper	Right	8.0	8.1	7.7	7.8
		Left	8.2		7.8	
	Lower	Right	7.0-[2]	7.0-	7.0	7.0-
		Left	7.2		7.0-	
2. Lateral Incisors	Upper	Right	9.2	9.1	8.6	8.8
		Left	8.9		9.0	
	Lower	Right	8.2	8.2	7.6	7.6
		Left	8.1		7.6	
3. Canine	Upper	Right	11.4	11.5	11.0	10.9
		Left	11.6		10.8	
	Lower	Right	11.3	11.3	9.9	9.9
		Left	11.2		9.9	
4. 1st Bicuspid	Upper	Right	10.4	10.5	9.7	9.8
		Left	10.6		9.9	
	Lower	Right	11.0	11.1	10.4	10.4
		Left	11.1		10.4	
5. 2nd Bicuspid	Upper	Right	11.9	11.9	11.6	11.6
		Left	11.8		11.5	
	Lower	Right	11.8	11.8	11.5	11.5
		Left	11.7		11.5	
6. 1st Molar	Upper	Right) Left)	7.0-	7.0-	7.0-	7.0-
	Lower	Right) Left)				
7. 2nd Molar	Upper	Right	12.2	12.2	12.1	12.1
		Left	12.1		12.0	
	Lower	Right	11.5	11.7	11.5	11.6
		Left	11.8		11.6	

1. Adapted from Kamalanathan, 1956.
2. 7.0- More than 50% of 7 year old children had this tooth erupted, hence the age of eruption is given as less than 7.0.

Table 21

Average Number of Teeth: Deciduous, Permanent, and Total, at Each Age, in Children 7 to 14 Years of Age, Bang Chan[1].

Age, years	Boys				Girls			
	Number Examined	Average No. Teeth			Number Examined	Average No. Teeth		
		Dec.	Perm.	Total		Dec.	Perm.	Total
7	5	15.0	6.4	21.4	8	17.3	5.5	22.8
8	18	14.9	7.8	22.7	16	14.5	9.0	23.5
9	9	12.4	10.6	23.0	8	12.0	10.8	22.8
10	23	9.5	14.8	24.3	13	6.3	17.6	23.9
11[2]	27	6.8	17.9	24.7	24	4.6	19.8	24.4
12[2]	23	4.2	21.9	26.1	20	3.0	22.6	25.6
13[2]	17	0.5	26.3	26.8	22	0.7	27.4	28.1
14	3	0.0	28.0	28.0	4	0.0	28.0	28.0

1. Adapted from tables in Kamalanathan, 1956.

2. Six children in the age groups 11 to 13 had one or more 3rd molars erupted.

Table 22

146 Summary of the Occurrence of Clinical Signs Possibly Related to Nutritional Deficiency, Bang Chan

	Random Sample of Families[1]							School Children[1]	
	Adults		Children						
	M	F	15-19 M	15-19 F	7-14 M	7-14 F	under 6 yrs.	Boys	Girls
Total number of persons examined	37	45	9	8	16	18	33	119	114
Clinical Signs									
Hb 11.5 g. or less/100 ml.	2	14	-	-	1	3	-	10	11
Hair - dry and staring	-	-	-	-	1	2	-	9	9
- diminution loss of pigment	-	-	-	-	-	-	-	-	1
Eyes - excess conjunctival tissue	3	6	-	-	-	-	-	-	-
Lips - cheilosis	-	-	-	-	-	-	-	1	1
- angular stomatitis	1	2	-	-	-	-	-	1	2
Tongue - papillae atrophied	-	1	-	-	1	-	-	1	1
- papillae hypertrophied	2	1	-	-	-	-	-	2	3
- appearance, fissured	1	1	-	-	1	-	-	2	-
- appearance, geographical	-	1	-	-	1	-	-	3	-
- NA Betel[2]	(8)[2]	(22)[2]	-	-	-	-	-	-	-

Table 22 (cont.)

	Random Sample of Families[1]							School Children[1]	
	Adults		Children						
			15-19		7-14		Under		
	M	F	M	F	M	F	6 yrs.	Boys	Girls
Gums - swelling	-	-	-	-	-	1	-	2	2
- redness	-	1	-	-	1	1	-	2	3
- recession	-	-	-	-	-	-	-	-	1
Thyroid enlarged	-	-	-	-	-	-	-	1	-
Skin - Symmetrical dermatosis	-	-	-	-	1	-	-	1	1
- phrynoderma	-	-	1	-	-	-	-	5	6
- xerosis	-	2	-	-	-	2	-	24	12
- loss of elasticity	-	7	-	-	-	-	-	3	-
- atrophic	-	6	-	-	-	-	-	-	-
- ulcers	-	-	-	-	1	1	-	8	6
Knee jerk absent	11	2	1	-	2	2	(5)[2]	-	3
Ankle jerk absent	9	2	1	-	-	1	(6)[2]	-	2
Liver enlarged	1	(2)[2]	-	(1)[2]	1	(2)[2]	1	14	7
Spleen enlarged	-	(2)[2]	-	(1)[2]	-	(2)[2]	-	-	1
Skeleton - bowed legs	13	13	1	-	2	-	2	8	1
- knock knees[3]	-	1	-	1	1	-	-	10	6

1. Eighteen children in Bang Chan primary school were also in the random sample of village families.
2. Not ascertained.
3. The term "knock knees" was not included in the schedule, but the figures are included here because it was mentioned so frequently under comments.

Table 23

146 Relation of Number of Possible Signs of Nutritional Deficiency to Vitality Ratings of School Children, Bang Chan

Vitality Ratings	Number of Persons	Number of Persons With Each Number of Clinical Signs						
		0	1	2	3	4	5	6 or more
Poor	2		1	1				
Fair	48	13	22	9	2		1	1
Good	182	95	58	24	3	2		
Not ascertained	1			1				
Total	233	108	81	35	5	2	1	1
Percentage of persons with each number of signs		46	35	15	4 (3 or more)			

Table 24

Relation of Number of Possible Signs of Nutritional Defiency to Vitality Ratings of Persons in the Random Sample of Village Households, Bang Chan

Vitality Ratings	Number of Persons	Number of Persons With Each Number of Clinical Signs						
		0	1	2	3	4	5	6 or more
Poor	1		1					
Fair	30	11	10	5	4			
Good	121	55	37	12	8	5	3	1
Not ascertained	14	12	1					1
Total	166	78	49	17	12	5	3	2
Percentage of persons with each number of signs		47	30	10	13 (3 or more)			